# 1989 AIAA Journal Index

## How to Use the Index

In the Subject Index, pages 1836–1843, each technical paper is listed under a maximum of three appropriate headings. Note the number in boldface type following each paper title, and use that number to locate the paper in the Chronological Index. The Author Index, pages 1843–1845, lists all authors associated with a given technical paper. The locating numbers are identical to those in the Subject Index. The Chronological Index, pages 1845–1855, lists all papers by their unique code numbers. This listing contains titles, authors and their affiliations, and volume, issue number, and page where the paper appeared. It also gives the AIAA paper number, if any, on which the article was based, as well as the "CP" or conference volume number if the paper was published in a bound collection of meetings papers. Comments, Replies, and Errata are listed directly beneath the paper to which they refer. If the paper to which they refer was published prior to 1989, that paper also will appear in both the Subject and Chronological Indexes. Authors of Comments also are listed in the Author Index. The Book Review Index, page 1855, lists the books reviewed during 1989, the author, publisher, reviewer, and the issue, number, and page on which the review appeared.

# **Subject Index**

## Aircraft Technology, Conventional, STOL/VTOL

#### Aerodynamics

Mechanism of Sidewall Effect Studied with Oil Flow Visualization Calculation of Asymmetric Vortex Separation on Cones and Tangent Ogives Based on Discrete Vortex Model J89-281 Essential Ingredients of a Method for Low Reynolds Number Airfoils J89-265 Navier-Stokes Computations of Lee-Side Flows over Delta Wings Potential Flow Calculation for Three-Dimensional Wings and Wing-Body Combination in Oscillatory Motion 189-262 New Method for Measurement of Surface Pressure Using Magnetic Tape 189.243 Closed-Form Solutions for Nonlinear Quasi-Unsteady Transonic Aerodynamics

J89-242
Application of the Hypersonic Analogy for
Validation of Numerical Simulations
189-241

Differing Development of the Velocity Profiles of Three-Dimensional Turbulent Boundary Layers J89-225
Use of the Kirchhoff Method in Acoustics

Unsteady Vortical Distrubances Around a Thin Airfoil in the Presence of a Wall

Numerical Simulation of Rolling Up of Leading/Trailing-Edge Vortex Sheets for Slender Wings J89-204 Surface Curvature Effect on the Calculation

of Separation Bubble J89-192
Calculation of Transonic Flows Over Bodies
of Varying Complexity Using Slender
Body Theory J89-184

Numerical Simulation of Vortical Flows
Over a Strake-Delta Wing J89-176
Effects of Transverse Curvature on Oscillatory Flow Along a Circular Cylinder

J89-170 Aerodynamics of High-Lift, Low-Aspect-Ratio Unswept Wings J89-165 Drag Measurements on a Laminar Flow

Body of Revolution J89-159
Investigation of the Flow Structure Around a
Rapidly Pitching Airfoil J89-154

Rapidly Pitching Airfoil J89-154
Viscous Aerodynamic Analysis of an Oscillating Flat-Plate Airfoil J89-150
Convergence of Lift and Drag Predictions by

a Morino Panel Method (VSAERO)

Flow Structure and Scaling Laws in Lateral Wing-Tip Blowing J89-146
Analysis of Low Reynolds Number Separation Bubbles Using Semiempirical Methods J89-145
Skin-Friction Measurements by Laser-Beam Interferometry J89-143

Numerical Study of Two-Dimensional Impinging Jet Flowfields J89-122 Separation Control on an Airfoil by Periodic Forcing J89-115

Turbulence Manipulation to Increase Effective Reynolds Numbers in Vehicle Aerodynamics J89-107

Explicit Runge-Kutta Method for Unsteady Rotor/Stator Interaction J89-104 Measurements in Separating Boundary Layers J89-101

Wakes of Four Complex Bodies of Revolution at Zero Angle of Attack J89-099 Extension and Application of Flux-Vector Splitting to Calculations on Dynamic Meshes J89-093

Analysis of Multi-Element Airfoils by a Vortex Panel Method J89-489 Surface Pressure Measurements on a Body Subject to Vortex Wake Interaction J89-076

Flow Visualization and Measurements in a Two-Dimensional Two-Impinging-Jet Flow J89-058

Flow Around Simply and Multiply Connected Bodies: A New Iterative Scheme for Conformal Mapping J89-046
Multiscale Turbulence Effects in Underex-

panded Supersonic Jets J89-042 Viscous Drag Reduction of a Nose Body J89-037

Scattering of Acoustic and Electromagnetic
Waves by an Airfoil 189-036
Wall-Layer Model for the Velocity Profile in
Turbulent Flows 189-023

Aerodynamic Performance and Flow Structure Studies of a Low Reynolds Number Airfoil J89-021

Turbulence Measurements in a Radial Upwash J89-006 Entropy Production in Nonsteady General

187-279

Coordinates J87
Aeroelasticity and Aeroservoelasticity

Flutter Analysis of Cantilever Composite
Plates in Subsonic Flow J89-162
Viscous Aerodynamic Analysis of an Oscillating Flat-Plate Airfoil J89-150
Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors in Hover 189-139

Analysis of Structures with Rotating, Flexible Substructures Applied to Rotorcraft Aeroelasticity J89-029

#### Aerospace Plane

Approximations for Nonequilibrium Hypervelocity Aerodynamics J89-276

## **Configuration Design**

Penetration and Ricochet Phenomena in Oblique Hypervelocity Impact J89-085 Shape Optimal Design Using Fictitious Loads J89-014

## Noise

Spectral Measurement of Pressure Fluctuations on Riblets J89-280 Sound Radiation from an Airfoil Encoun-

tering an Oblique Gust in its Plane of Motion

Generalized Method of Predicting Optimal

Generalized Method of Predicting Optimal
Performance of Active Noise Controllers
J89-228

Asymptotic Theory of Propeller Noise--Part

I: Subsonic Single-Rotation Propeller

Active Control of Sound Fields in Elastic
Cylinders by Multicontrol Forces J89-124
Supersonic Propeller Noise in a Uniform
Flow J89-053

## Powerplant Integration

Transitional Flow on Axial Turbomachine Blading J89-079

## Propeller and Rotor Systems

Stability of a Viscoelastic Rotor-Disk System under Dynamic Axial Loads J89-256
Vibration Analysis of Composite Turbopropellers Using a Nonlinear Beam-Type
Finite-Element Approach J89-247
Asymptotic Theory of Propeller Noise-Part
1: Subsonic Single-Rotation Propeller

Variations of Undamped Rotor Blade Frequencies Subjected to Transient Heat Flux

Blade-Vortex Interaction J89-097
Surface Pressure Measurements on a Body
Subject to Vortex Wake Interaction

Supersonic Propeller Noise in a Uniform

Flow J89-053
Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors
in Hover J89-035

# 1989 AIAA Journal Index

## How to Use the Index

In the Subject Index, pages 1836–1843, each technical paper is listed under a maximum of three appropriate headings. Note the number in boldface type following each paper title, and use that number to locate the paper in the Chronological Index. The Author Index, pages 1843–1845, lists all authors associated with a given technical paper. The locating numbers are identical to those in the Subject Index. The Chronological Index, pages 1845–1855, lists all papers by their unique code numbers. This listing contains titles, authors and their affiliations, and volume, issue number, and page where the paper appeared. It also gives the AIAA paper number, if any, on which the article was based, as well as the "CP" or conference volume number if the paper was published in a bound collection of meetings papers. Comments, Replies, and Errata are listed directly beneath the paper to which they refer. If the paper to which they refer was published prior to 1989, that paper also will appear in both the Subject and Chronological Indexes. Authors of Comments also are listed in the Author Index. The Book Review Index, page 1855, lists the books reviewed during 1989, the author, publisher, reviewer, and the issue, number, and page on which the review appeared.

# **Subject Index**

## Aircraft Technology, Conventional, STOL/VTOL

#### Aerodynamics

Mechanism of Sidewall Effect Studied with Oil Flow Visualization Calculation of Asymmetric Vortex Separation on Cones and Tangent Ogives Based on Discrete Vortex Model J89-281 Essential Ingredients of a Method for Low Reynolds Number Airfoils J89-265 Navier-Stokes Computations of Lee-Side Flows over Delta Wings Potential Flow Calculation for Three-Dimensional Wings and Wing-Body Combination in Oscillatory Motion 189-262 New Method for Measurement of Surface Pressure Using Magnetic Tape 189.243 Closed-Form Solutions for Nonlinear Quasi-Unsteady Transonic Aerodynamics

J89-242
Application of the Hypersonic Analogy for
Validation of Numerical Simulations
189-241

Differing Development of the Velocity Profiles of Three-Dimensional Turbulent Boundary Layers J89-225
Use of the Kirchhoff Method in Acoustics

Unsteady Vortical Distrubances Around a Thin Airfoil in the Presence of a Wall

Numerical Simulation of Rolling Up of Leading/Trailing-Edge Vortex Sheets for Slender Wings J89-204 Surface Curvature Effect on the Calculation

of Separation Bubble J89-192
Calculation of Transonic Flows Over Bodies
of Varying Complexity Using Slender
Body Theory J89-184

Numerical Simulation of Vortical Flows
Over a Strake-Delta Wing J89-176
Effects of Transverse Curvature on Oscillatory Flow Along a Circular Cylinder

J89-170 Aerodynamics of High-Lift, Low-Aspect-Ratio Unswept Wings J89-165 Drag Measurements on a Laminar Flow

Body of Revolution J89-159
Investigation of the Flow Structure Around a
Rapidly Pitching Airfoil J89-154

Rapidly Pitching Airfoil J89-154
Viscous Aerodynamic Analysis of an Oscillating Flat-Plate Airfoil J89-150
Convergence of Lift and Drag Predictions by

a Morino Panel Method (VSAERO)

Flow Structure and Scaling Laws in Lateral Wing-Tip Blowing J89-146
Analysis of Low Reynolds Number Separation Bubbles Using Semiempirical Methods J89-145
Skin-Friction Measurements by Laser-Beam Interferometry J89-143

Numerical Study of Two-Dimensional Impinging Jet Flowfields J89-122 Separation Control on an Airfoil by Periodic Forcing J89-115

Turbulence Manipulation to Increase Effective Reynolds Numbers in Vehicle Aerodynamics J89-107

Explicit Runge-Kutta Method for Unsteady Rotor/Stator Interaction J89-104 Measurements in Separating Boundary Layers J89-101

Wakes of Four Complex Bodies of Revolution at Zero Angle of Attack J89-099 Extension and Application of Flux-Vector Splitting to Calculations on Dynamic Meshes J89-093

Analysis of Multi-Element Airfoils by a Vortex Panel Method J89-489 Surface Pressure Measurements on a Body Subject to Vortex Wake Interaction J89-076

Flow Visualization and Measurements in a Two-Dimensional Two-Impinging-Jet Flow J89-058

Flow Around Simply and Multiply Connected Bodies: A New Iterative Scheme for Conformal Mapping J89-046
Multiscale Turbulence Effects in Underex-

panded Supersonic Jets J89-042 Viscous Drag Reduction of a Nose Body J89-037

Scattering of Acoustic and Electromagnetic
Waves by an Airfoil 189-036
Wall-Layer Model for the Velocity Profile in
Turbulent Flows 189-023

Aerodynamic Performance and Flow Structure Studies of a Low Reynolds Number Airfoil J89-021

Turbulence Measurements in a Radial Upwash J89-006 Entropy Production in Nonsteady General

187-279

Coordinates J87
Aeroelasticity and Aeroservoelasticity

Flutter Analysis of Cantilever Composite
Plates in Subsonic Flow J89-162
Viscous Aerodynamic Analysis of an Oscillating Flat-Plate Airfoil J89-150
Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors in Hover 189-139

Analysis of Structures with Rotating, Flexible Substructures Applied to Rotorcraft Aeroelasticity J89-029

#### Aerospace Plane

Approximations for Nonequilibrium Hypervelocity Aerodynamics J89-276

## **Configuration Design**

Penetration and Ricochet Phenomena in Oblique Hypervelocity Impact J89-085 Shape Optimal Design Using Fictitious Loads J89-014

## Noise

Spectral Measurement of Pressure Fluctuations on Riblets J89-280 Sound Radiation from an Airfoil Encoun-

tering an Oblique Gust in its Plane of Motion

Generalized Method of Predicting Optimal

Generalized Method of Predicting Optimal
Performance of Active Noise Controllers
J89-228

Asymptotic Theory of Propeller Noise--Part

I: Subsonic Single-Rotation Propeller

Active Control of Sound Fields in Elastic
Cylinders by Multicontrol Forces J89-124
Supersonic Propeller Noise in a Uniform
Flow J89-053

## Powerplant Integration

Transitional Flow on Axial Turbomachine Blading J89-079

## Propeller and Rotor Systems

Stability of a Viscoelastic Rotor-Disk System under Dynamic Axial Loads J89-256
Vibration Analysis of Composite Turbopropellers Using a Nonlinear Beam-Type
Finite-Element Approach J89-247
Asymptotic Theory of Propeller Noise-Part
1: Subsonic Single-Rotation Propeller

Variations of Undamped Rotor Blade Frequencies Subjected to Transient Heat Flux

Blade-Vortex Interaction J89-097
Surface Pressure Measurements on a Body
Subject to Vortex Wake Interaction

Supersonic Propeller Noise in a Uniform

Flow J89-053
Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors
in Hover J89-035

#### Rotorcraft

Sound Radiation from an Airfoil Encountering an Oblique Gust in its Plane of Motion J89-279
Blade-Vortex Interaction J89-097

Analysis of Structures with Rotating, Flexible Substructures Applied to Rotorcraft Aeroelasticity J89-029

#### Stealth

Scattering of Acoustic and Electromagnetic Waves by an Airfoil J89-036

#### STOL/VTOL/STOVL

Aerodynamics of High-Lift, Low-Aspect-Ratio Unswept Wings J89-165

## Structural Design (Including Loads)

Mass Matrix Modification Using Element Correction Method J89-020

#### Structural Materials

Buckling and Postbuckling of Laminated Composite Plates with Ply Dropoffs

Recent Advances in Analysis of Laminated Beams and Plates Part II: Vibrations and Wave Propagation J89-136

Recent Advances in Analysis of Laminated Beams and Plates Part I: Shear Effects and Buckling J89-135

Continuum-Based Stiffened Composite Shell Element for Geometrically Nonlinear Analysis 389-013

## Testing, Flight and Ground

Mechanism of Sidewall Effect Studied with Oil Flow Visualization J89-284

Drag Measurements on a Laminar Flow Body of Revolution J89-159

Estimation and Identification of Nonlinear Dynamic Systems J89-140

Mass Matrix Modification Using Element Correction Method J89-020

#### Vibration

New Concepts for Finite-Element Mass Matrix Formulations J89-187 Transverse Vibrations of a Trapezoidal Cantilever Plate of Variable Thickness

Accurate Analytical Solution for Free Vibration of the Simply Supported Triangular Plate
Strong Mode Localization in Nearly Periodic Disordered Structures

J89-033

#### Weather Hazards

Estimation and Identification of Nonlinear Dynamic Systems J89-140

#### **Energy**

## Laser Integration/Systems

Short Wavelength Chemical Lasers J89-009

## Reciprocating Machinery

Induced Emission of Radiation from a Large Space-Station-Like Structure in the Ionosphere J89-060

## **Rotating Machinery**

Stability of a Viscoelastic Rotor-Disk System under Dynamic Axial Loads J89-256
Turbulence Model for Rotating Flows

Explicit Runge-Kutta Method for Unsteady Rotor/Stator Interaction J89-104 Computational Aerodynamics of Oscillating Cascades with the Evolution of Stall

#### Fluid Dynamics

#### Aeroacoustics

Sound Radiation from an Airfoil Encountering an Oblique Gust in its Plane of Motion J89-279

Free-Field Correction Factor for Spherical Acoustic Waves Impinging on Cylinders

Propagation of Quasiplane Acoustic Waves along an Impedance Boundary J89-229 New Series Expansion Method for the Solution of the Falkner-Skan Equation

Nozzle Geometry Effects on Supersonic Jet Interaction J89-210 Asymptotic Theory of Propeller Noise--Part

I: Subsonic Single-Rotation Propeller

J89-179

Effect of Initial Swirl Distribution on the Evolution of a Turbulent Jet Downwind Sound Propagation in an Atmospheric Boundary Layer J89-070

Initial Development of Noncircular Jets
Leading to Axis Switching J89-057
Resonance Prediction for Closed and Open
Wind Tunnel by the Finite-Element Meth-

od J89-054 Supersonic Propeller Noise in a Uniform Flow J89-053

Scattering of Acoustic and Electromagnetic Waves by an Airfoil J89-036

## Boundary Layers and Heat Transfer—Laminar

Computation of Unsteady Laminar Boundary Layers Subject to Traveling-Wave Freestream Fluctuations J89-252

Upwind Algorithm for the Parabolized Navier-Stokes Equations J89-178 Boundary-Layer Tables for Similar Com-

pressible Flow J89-177
Flow Structure and Scaling Laws in Lateral
Wing-Tip Blowing J89-146

Numerical Instabilities in the Calculation of Laminar Separation Bubbles and Their Implications J89-088

Composite Laminate Free-Edge Reinforcement with U-Shaped Caps Part I: Stress Analysis J89-081

Boundary-Layer Predictions for Small Low-Speed Contractions J89-050 Selective Suction for Controlling Bursting

Events in a Boundary Layer J89-041 Fluctuating Flow Due to Unsteady Rotation of a Disk J89-024

#### Boundary Layers and Heat Transfer—Turbulent

High Reynolds Number Wedge-Induced Separation Lengths at Mach 6 J89-282 Spectral Measurement of Pressure Fluctuations on Riblets J89-280

Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow. Part II: Reynolds Stress and κ-ε Models J89-269

Defect Stream Function, Law-of-the-Wall/ Wake Method Turbulent Boundary Layers

Three-Dimensional Shear-Driven Boundary-Layer Flow with Streamwise Adverse Pressure Gradient
Critique of Turbulence Models for Shock-

Induced Flow Separation J89-254
Differing Development of the Velocity Profiles of Three-Dimensional Turbulent
Boundary Layers J89-225

Turbulence Modeling in a Hypersonic Inlet

Second-Moment Closure for the Near-Wall Sublayer: Development and Application

Evaluation of the Gradient Model of Turbulent Transport Through Direct Lagrangian Simulation J89-193

Reynolds Number Effect on Separation Structures at Normal Shock Wave/Turbulent Boundary-Layer Interaction

Boundary-Layer Tables for Similar Compressible Flow J89-177
Velocity Profile Model for Two-Dimensional Zero-Pressure Gradient Transitional Boundary Layers J89-167

Experimental Comparison of Two Hot-Wire Techniques in Supersonic Flow J89-158 Near-Wall  $\kappa$ - $\epsilon$  Turbulence Modeling

Turbulence Structure in a Shock Wave/Turbulent Boundary-Layer Interaction

Calculation of Flow Over Iced Airfoils

Modeling of Density Fluctuations in Supersonic Turbulent Boundary Layers J89-116 Turbulence Model for Rotating Flows

Measurements in Separating Boundary
Layers J89-101

Composite Laminate Free-Edge Reinforcement with U-Shaped Caps Part I: Stress
Analysis

389-061
389-061

Evaluation of Algebraic Turbulence Models for PNS Predictions of Supersonic Flow Past a Sphere-Cone J89-075 Investigation of the Influence of Blowing and

Combustion on Turbulent Wall Boundary Layers J89-049 Curvature-Dependent Two-Equation Model

for Prediction of Turbulent Recululating
Flows
J89-045
Selective Suction for Controlling Bursting

Events in a Boundary Layer J89-041
Structural Similarity of Turbulence in Fully
Developed Smooth Pipe Flow J89-038
Viscous Drag Reduction of a Nose Body

Decay Process of a Manipulated Large-Scale Horseshoe Vortex in a Turbulent Boundary Layer Model for the Velocity Profile in

Wall-Layer Model for the Velocity Profile in Turbulent Flows J89-023

Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow Part I: Algebraic Stress and κ-ε Models J89-004 Response of a Compressible, Turbulent Boundary Layer to a Short Region of

Surface Curvature J89-003 Finite-Difference Outer-Layer, Analytic Inner-Layer Method for Turbulent Boundary Layers J89-002

Determination of Length Scales in Algebraic
Turbulence Models for Navier-Stokes
Methods J89-001

Two-Equation Turbulence Model Consistent with the Second Law J87-265

## **Boundary-Layer Stability and Transition**

Study of Inviscid, Supersonic Mixing Layers
Using a Second-Order Total Variational
Diminishing Scheme J89-277
Instability of Nonuniform Density Free
Shear Layers with a Wake Profile

199,272

Essential Ingredients of a Method for Low Reynolds Number Airfoils J89-265 Prediction and Control of Transition in Supersonic and Hypersonic Boundary J89-236 Lavers Unsteady Transition Location J89-169 Velocity Profile Model for Two-Dimensional Zero-Pressure Gradient Transitional **Boundary Layers** J89-167 Analysis of Low Reynolds Number Separation Bubbles Using Semiempirical Methode Skin-Friction Measurements by Laser-Beam Interferometry J89-143 Prediction of Transition Due to Isolated 189-127 Turbulence Manipulation to Increase Effective Reynolds Numbers in Vehicle Aerodynamics J89-107 Boundary-Layer Transition on a Cone and Flat Plate at Mach 3.5 J89-096 Linear Instability Waves in Supersonic Turbulent Mixing Layers J89-095 Composite Laminate Free-Edge Reinforcement with U-Shaped Caps Part I: Stress Analysis J89-081 Transitional Flow on Axial Turbomachine Blading 190,070 Optical Boundary-Layer Transition Detection in a Transonic Wind Tunnel 189-056 Selective Suction for Controlling Bursting Events in a Boundary Layer J89-041 Görtler Instability of Wall Jets J89-017

**Computational Fluid Dynamics** 

Coordinates

Numerical Modeling of a Radio Frequency Plasma in Argon 189-283 Study of Inviscid, Supersonic Mixing Layers Using a Second-Order Total Variational Diminishing Scheme Numerical Study of Chemically Reacting Flows Using an LU-SSOR Scheme

Entropy Production in Nonsteady General

J87-279

Mixing Control in a Plane Shear Layer J89-274

Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow. Part II: Reynolds Stress and k-e Models J89-269 Essential Ingredients of a Method for Low Reynolds Number Airfoils 189-265 Navier-Stokes Computations of Lee-Side Flows over Delta Wings 189-264 Closed-Form Solutions for Nonlinear Quasi-Unsteady Transonic Aerodynamics

199,242 Progress in Direct Numerical Simulations of Turbulent Reacting Flows Vortex Simulation of Spatially Growing Three-Dimensional Mixing Layers J89-235 Comparison of Iterative and Direct Solution Methods for Viscous Flow Problems

199,726 New Series Expansion Method for the Solution of the Falkner-Skan Equation

Euler Correction Method for Two- and Three-Dimensional Transonic Flows

Spatiotemporal Adaptation Algorithm for Two-Dimensional Reacting Flows J89-211 Turbulence Modeling in a Hypersonic Inlet J89-209

Comparative Study of High-Resolution Shock-Capturing Schemes for a Real Gas

J89-207 Constructing a Continuous Parameter Range of Computational Flows J89-206 Second-Moment Closure for the Near-Wall Sublayer: Development and Application 189-205

Finite-Element Method Applied to Transonic Flow Over a Bulbous Payload Shroud

Steady, Shock-Capturing Method Applied to One-Dimensional Nozzle Flow J89-194 Computational Analysis of Three-Dimensional Turbulent Flow Around a Bluff **Body in Ground Proximity** J89-183

Upwind Algorithm for the Parabolized Navier-Stokes Equations J89-178 Boundary-Layer Tables for Similar Compressible Flow J89-177

Numerical Simulation of Vortical Flows Over a Strake-Delta Wing J89-176 Finite-Element Navier-Stokes Analysis of the Flow About a Finite Plate J89-160

Unsteady Transonic Airfoil Computation Using Implicit Euler Scheme on Body-Fixed Grid J89-152

Convergence of Lift and Drag Predictions by a Morino Panel Method (VSAERO) J89-149 Pressure-Based Navier-Stokes Solver Using the Multigrid Method J89-148

Computational/Experimental Study of the Flowfield on a Body of Revolution at Incidence

Trajectory Integration in Vortical Flows J89-142 Godunov Computational Fluid Dynamics Method for Extreme Flow Velocities and Any Equation of State

Three-Dimensional Viscous Flow Solutions with a Vorticity-Stream Function Formulation J89-130 Newton Solution of Inviscid and Viscous **Problems** J89-129

Three-Dimensional Dual-Potential Procedure for Inlets and Indraft Wind Tunnels

Prediction of Transition Due to Isolated Roughness 189-127 Calculation of Flow Over Iced Airfoils

Numerical Study of Two-Dimensional Impinging Jet Flowfields J89-122 Large-Scale Viscous Simulation of Laminar

Vortex Flow Over a Delta Wing J89-121 Explicit Runge-Kutta Method for Unsteady Rotor/Stator Interaction

Extension and Application of Flux-Vector Splitting to Calculations on Dynamic Meshes 189-093 Unsteady Pressure Distribution Over a Pitching Airfoil

Development of a Viscous Cascade Code Based on Scalar Implicit Factorization

Experimental and Numerical Study of Confined Coaxial Turbulent Jets J89-072 Analysis of Flux-Split Algorithms for Euler's Equations with Real Gases J89-071 Computations of Supersonic Flows Over a

Body at High Angles of Attack J89-059 Flow Around Simply and Multiply Connected Bodies: A New Iterative Scheme for Conformal Mapping 189-046

Curvature-Dependent Two-Equation Model for Prediction of Turbulent Recirculating Semi-Implicit and Fully Implicit Shock-

Capturing Methods for Nonequilibrium Flows Upwind Formulations for the Euler Equa-

tions in Steady Supersonic Flows J89-039 Upwind Formulations for the Euler Equations in Steady Supersonic Flows J89-039 Nonlinear Vibrations of Unsymmetrically Laminated Beams J89-030

Fluctuating Flow Due to Unsteady Rotation of a Disk

Wall-Layer Model for the Velocity Profile in Turbulent Flows Diagonal Implicit Multigrid Calculation of Inlet Flowfields 189-016

Adaptation Methods for a New Navier-Stokes Algorithm

Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow Part I: Algebraic Stress and k-e Models J89-904 Finite-Difference Outer-Layer, Analytic

Inner-Layer Method for Turbulent Boundary Layers 189-002 Determination of Length Scales in Algebraic

Turbulence Models for Navier-Stokes New Eddy Viscosity Model of Computation

of Swirling Turbulent Flows

Hydrodynamics

Spectral Measurment of Pressure Fluctuations on Riblets 199,798 Spectral Observation in a Forced Mixing Laver

Instability of Nonuniform Density Free Shear Layers with a Wake Profile

Vortical Patterns in the Wake of an Oscillating Airfoil J89-181 Convergence of Lift and Drag Predictions by a Morino Panel Method (VSAERO)

Effects of a Downstream Disturbance on the Structure of a Turbulent Plane Mixing Laver

Hypersonic Flow

High Reynolds Number Wedge-Induced Separation Lengths at Mach 6 Approximations for Nonequilibrium Hypervelocity Aerodynamics J89-276 Numerical Study of Chemically Reacting

Flows Using an LU-SSOR Scheme Defect Stream Function, Law-of-the-Wall/

Wake Method Turbulent Boundary Layers

Application of the Hypersonic Analogy for Validation of Numerical Simulations J89-241

Prediction and Control of Transition in Supersonic and Hypersonic Boundary 189-230 Analysis of the Expansion-Fan Flowfield for Holes in a Hypersonic Configuration

J89-186 Upwind Algorithm for the Parabolized Navier-Stokes Equations Turbulence Structure in an Initial Mixing Region of a Two-Dimensional Curved Jet 189-153

Shock Standoff from Blunt Cones in High-Enthalpy Nonequilibrium Nitrogen Flow 189,133

Godunov Computational Fluid Dynamics Method for Extreme Flow Velocities and Any Equation of State J89-132 Effect of Initial Swirl Distribution on the Evolution of a Turbulent Jet J89-098

Analysis of Flux-Split Algorithms for Euler's Equations with Real Gases J89-071 Interaction of Jet in Hypersonic Cross J89-043

Inlet, Nozzle, Diffusor, and Channel Flows

Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow Part II: Reynolds Stress and κ-ε Models J89-269 Experimental Investigation of Confined Turbulent jets--Part II: Particle-Laden Flow 189-234

**Atomized Sprays** 

mulation

Three-Dimensional Viscous Flow Solutions

with a Vorticity-Stream Function For-

J89-131

J89-130

Rapidly Pitching Airfoil

Turbulence Structure in an Initial Mixing

Region of a Two-Dimensional Curved Jet

Experimental Investigation of Confined Tur- bulent Jets Part I: Single-Phase Data	Prediction of Transition Due to Isolated Roughness J89-127 Calculation of Flow Over Iced Airfoils	Progress in Direct Numerical Simulations of Turbulent Reacting Flows J89-239
Inviscid, Unsteady, Transonic Axisymmetric Flow in Nozzles with Shock Waves	J89-125 Numerical Study of Two-Dimensional Im-	Spatiotemporal Adaptation Algorithm for Two-Dimensional Reacting Flows J89-211 Analysis of Flux-Split Algorithms for Euler's
J89-195 Diffuser Performance of Two-Stream Su-	pinging Jet Flowfields J89-122 Large-Scale Viscous Simulation of Laminar	Equations with Real Gases J89-071 Finite-Element Analysis of Turbulent Dif-
personic Wind Tunnels Near-Wall k-ε Turbulence Modeling	Vortex Flow Over a Delta Wing J89-121 Separation Shock Motion in Fin, Cylinder,	fusion Flames J89-044 Semi-Implicit and Fully Implicit Shock-
J89-157 Further Experiments on Supersonic Turbu-	and Compression RampInduced Turbu- lent Interactions J89-103	Capturing Methods for Nonequilibrium Flows J89-040
lent Flow Development in a Square Duct J89-151	Effects of Nozzle Exit Boundary-Layer Con- ditions on Excitability of Heated Free Jets	Laser Diagnostics of Reacting Stagnation Point Flow J89-010
Three-Dimensional Dual-Potential Proce- dure for Inlets and Indraft Wind Tunnels 389-128	Wakes of Four Complex Bodies of Revo- lution at Zero Angle of Attack J89-099	Separated Flows
Separating Flow Over Repeated Surface-	Linear Instability Waves in Supersonic Tur-	High Reynolds Number Wedge-Induced Separation Lengths at Mach 6 J89-282
Mounted Ribs in a Square Duct J89-108 Effects of Nozzle Exit Boundary-Layer Con- ditions on Excitability of Heated Free Jets J89-100	bulent Mixing Layers J89-095 Surface Pressure Measurements on a Body Subject to Vortex Wake Interaction	Separation Shock Dynamics in Mach 5 Turbulent Interactions Induced by Cyl- inders J89-267
Calculation of Planar and Conical Diffuser Flows J89-073	Structure of Turbulent Sonic Underexpanded	Three-Dimensional Shear-Driven Bounda- ry-Layer Flow with Streamwise Adverse
Boundary-Layer Predictions for Small Low- Speed Contractions J89-050	Free Jets J89-074 Calculation of Planar and Conical Diffuser	Pressure Gradient J89-266 Critique of Turbulence Models for Shock-
Structural Similarity of Turbulence in Fully Developed Smooth Pipe Flow J89-038	Flows J89-073 Experimental and Numerical Study of Con-	Induced Flow Separation J89-254 Shock-Wave/Boundary-Layer Interaction at
Subcritical Swirling Flows in Convergent,	fined Coaxial Turbulent Jets J89-072 Flow Structures of Coaxial Jet of Mean	a Swept Compression Corner J89-253 Surface Curvature Effect on the Calculation
Annular Nozzles J89-028 Diagonal Implicit Multigrid Calculation of	Velocity Ratio 0.5  Flow Visualization and Measurements in a	of Separation Bubble J89-192 Numerical and Experimental Evaluations of
Inlet Flowfields J89-016 Laser Diagnostics of Reacting Stagnation	Two-Dimensional Two-Impinging-Jet Flow J89-658	the Flow Past Nested Chevrons J89-094
Point Flow J89-010 Solutions of One-Dimensional Steady Nozzle	Initial Development of Noncircular Jets Leading to Axis Switching J89-057	Shock Waves and Detonations
Flow Revisited J88-105  Jets, Wakes, and Viscid-Inviscid Flow	Interaction of Jet in Hypersonic Cross Stream J89-043	Numerical Study of Chemically Reacting
Interactions	Multiscale Turbulence Effects in Underex- panded Supersonic Jets J89-042	Flows Using an LU-SSOR Scheme J89-275
Mixing Control in a Plane Shear Layer J89-274 Spectral Observation in a Forced Mixing	Effects of a Downstream Disturbance on the Structure of a Turbulent Plane Mixing	Critique of Turbulence Models for Shock- Induced Flow Separation J89-254 Shock-Wave/Boundary-Layer Interaction at
Layer J89-273 Instability of Nonuniform Density Free Shear Layers with a Wake Profile	Layer J89-026 Combined LDV and Rayleigh Measurements in a Complex Turbulent Mixing Flow J89-015	a Swept Compression Corner J89-253 Application of the Hypersonic Analogy for Validation of Numerical Simulations
Modeling of Liquid Jets Injected Trans- versely into a Supersonic Crossflow J89-270	Laser Diagnostics of Reacting Stagnation Point Flow J89-010	Experimental Shock-Wave Interference Heating on a Cylinder at Mach 6 and 8
Experimental Shock-Wave Interference Heating on a Cylinder at Mach 6 and 8	Effects of Curvature on the Initial Mixing Region of a Two-Dimensional Jet	Comparative Study of High-Resolution
J89-240 Investigation of Turbulent Jet Impingement	Turbulence Measurements in a Radial	Shock-Capturing Schemes for a Real Gas J89-207
in a Confined Crossflow J89-237  Measurement of Residence Time, Air En-	Upwash 389-066 New Eddy Viscosity Model of Computation of Swirling Turbulent Flows 387-174	Reynolds Number Effect on Separation Structures at Normal Shock Wave/Tur- bulent Boundary-Layer Interaction
trainment Rate, and Base Pressure in the Near Wake of a Cylindrical Body in	Multiphase Flows	J89-182 Shock Standoff from Blunt Cones in High-
Subsonic Flow J89-236 Vortex Simulation of Spatially Growing Three-Dimensional Mixing Layers J89-235	Experimental Investigation of Confined Tur- bulent jets-Part II: Particle-Laden Flow	Enthalpy Nonequilibrium Nitrogen Flow J89-133
Experimental Investigation of Confined Tur- bulent Jets—Part II: Particle-Laden Flow	Data J89-234 Turbulence Modeling in a Hypersonic Inlet	Subsonic Flow
Data J89-234 Experimental Investigation of Confined Tur-	Structure and Mixing Properties of Pressure- Atomized Sprays J89-131	Three-Dimensional Shear-Driven Bounda- ry-Layer Flow with Streamwise Adverse
bulent Jets Part I: Single-Phase Data J89-233	Evolution of Particle-Laden Jet Flows: A Theoretical and Experimental Study	Pressure Gradient J89-266 Theory for Radial Jet Reattachment Flow
Theory for Radial Jet Reattachment Flow J89-232 Flow Percent and Intermittency of a Tue	J89-027	J89-232 Comparison of Iterative and Direct Solution Methods for Viscous Flow Problems
Flow Reversal and Intermittency of a Tur- bulent Jet J89-231	Plasmadynamics and MHD	J89-226
Calculation of Laminar Separation Bubbles in the Wake Inflation/Deflation Regime J89-180	Numerical Modeling of a Radio Frequency Plasma in Argon J89-283	Numerical Simulation of Rolling Up of Leading/Trailing-Edge Vortex Sheets for Slender Wings J89-204
Experimental Investigation of Straight and Curved Annular Wall Jets J89-156	Rarefied Flows	Parametric Study of Statistical Bias in Laser Doppler Velocimetry J89-171
Trajectory Integration in Vortical Flows J89-142	Direct Simulation of Three-Dimensional Hypersonic Flow About Intersecting Blunt	Near-Wall x-e Turbulence Modeling  J89-157
S*-ucture and Mixing Properties of Pressure- Atomized Sprays 189-131	Wedges J89-238	Investigation of the Flow Structure Around a Rapidly Pitching Airfoil J89-154

**Reacting Flows and Combustion** 

velocity Aerodynamics

Approximations for Nonequilibrium Hyper-

Analysis of Low Reynolds Number Separation Bubbles Using Semiempirical Methods

J89-145

Three-Dimensional Viscous Flow Solutions

with a Vorticity-Stream Function Formulation J89-130

Elimination of Temperature Stratification in a Low-Speed Open-Return Wind Tunnel 389-117

Effect of Initial Swirl Distribution on the Evolution of a Turbulent Jet J89-098 Unsteady Pressure Distribution Over a Pitch-

ing Airfoil J89-090
Boundary-Layer Predictions for Small LowSpeed Contractions J89-050

Structural Similarity of Turbulence in Fully Developed Smooth Pipe Flow J89-438 Combined LDV and Rayleigh Measurements in a Complex Turbulent Mixing Flow

Effects of Curvature on the Initial Mixing Region of a Two-Dimensional Jet

J89-007

J89-015

## Supersonic Flow

Separation Shock Dynamics in Mach 5
Turbulent Interactions Induced by Cylinders
Navier-Stokes Computations of Lee-Side
Flows over Delta Wings J89-264
Shock-Wave/Boundary-Layer Interaction at a Swept Compression Corner
New Method for Measurement of Surface
Pressure Using Magnetic Tape J89-243
Experimental Shock-Wave Interference

Heating on a Cylinder at Mach 6 and 8 J89-240
Prediction and Control of Transition in Supersonic and Hypersonic Boundary

Layers J89-230
Nozzle Geometry Effects on Supersonic Jet

Interaction J89-210 Combustion-Related Shear-Flow Dynamics in Elliptic Supersonic Jets J89-208

in Emptic Supersonic Jets 389-208
Steady, Shock-Capturing Method Applied to
One-Dimensional Nozzle Flow J89-194
Vortical Patterns in the Wake of an Oscil-

Vortical Patterns in the Wake of an Oscillating Airfoil J89-181 Mass Transfer in a Binary Gas Jet J89-168

Diffuser Performance of Two-Stream Supersonic Wind Tunnels J89-166 Experimental Comparison of Two Hot-Wire

Techniques in Supersonic Flow J89-158 Equation for the Probability Density Function of Velocity and Scalar for Turbulent Shear Flows 189-155

Turbulence Structure in an Initial Mixing Region of a Two-Dimensional Curved Jet

Further Experiments on Supersonic Turbulent Flow Development in a Square Duct 189-151

Turbulence Structure in a Shock Wave/Turbulent Boundary-Layer Interaction

Separation Shock Motion in Fin, Cylinder, and Compression Ramp--Induced Turbulent Interactions J89-103

Boundary-Layer Transition on a Cone and Flat Plate at Mach 3.5

J89-096

Furthering of Alechesia Turbulana Medale

Evaluation of Algebraic Turbulence Models for PNS Predictions of Supersonic Flow Past a Sphere-Cone J89-075 Structure of Turbulent Sonic Underexpanded

Free Jets J89-074
Computations of Supersonic Flows Over a

Body at High Angles of Attack J89-059
Multiscale Turbulence Effects in Underexpanded Supersonic Jets J89-042

Semi-Implicit and Fully Implicit Shock-Capturing Methods for Nonequilibrium Flows J89-040

Upwind Formulations for the Euler Equations in Steady Supersonic Flows 189-039 Evolution of Particle-Laden Jet Flows: A Theoretical and Experimental Study

J89-027
Effects of a Downstream Disturbance on the
Structure of a Turbulent Plane Mixing
Layer 189-026

Three-Dimensional Base-Flow Calculation for a Projectile at Transonic Velocity J89-022

Improved Method of Analyzing Hot-Wire Measurements in Supersonic Turbulence

Response of a Compressible, Turbulent Boundary Layer to a Short Region of Surface Curvature J89-003

#### Transonic Flow

Design of Axisymmetric Bodies with Minimum Transonic Drag J89-278 Closed-Form Solutions for Nonlinear Quasi-Unsteady Transonic Aerodynamics

Transonic Flows with Vorticity Transport
Around Slender Bodies J89-227

Euler Correction Method for Two- and Three-Dimensional Transonic Flows

J89-212
Transonic Flow Modes of an Axisymmetric
Blunt Body J89-197
Finite-Element Method Applied to Transon-

ic Flow Over a Bulbous Payload Shroud J89-196 Inviscid, Unsteady, Transonic Axisymmetric

Flow in Nozzles with Shock Waves
J89-195
Steady, Shock-Capturing Method Applied to
One-Dimensional Nozzle Flow
J89-194

Calculation of Transonic Flows Over Bodies of Varying Complexity Using Slender Body Theory J89-184 Unsteady Transonic Airfoil Computation

Unsteady Iransonic Airfoli Computation
Using Implicit Euler Scheme on BodyFixed Grid J89-152
Newton Solution of Inviscid and Viscous

Problems J89-129 Large-Scale Viscous Simulation of Laminar Vortex Flow Over a Delta Wing J89-121 Integrated Approach for Active Coupling of

Structures and Fluids J89-110
Calculation of Unsteady Flows in Turbomachinery Using the Linearized Euler

Equations J89-109
Subcritical Swirling Flows in Convergent,
Annular Nozzles J89-028

Three-Dimensional Base-Flow Calculation for a Projectile at Transonic Velocity

Diagonal Implicit Multigrid Calculation of Inlet Flowfields J89-016

Determination of Length Scales in Algebraic Turbulence Models for Navier-Stokes Methods J89-001

## Unsteady Flows

Study of Inviscid, Supersonic Mixing Layers
Using a Second-Order Total Variational
Diminishing Scheme J89-277
Mixing Control in a Plane Shear Layer

J89-274
Separation Shock Dynamics in Mach 5
Turbulent Interactions Induced by Cylinder

Potential Flow Calculation for Three-Dimensional Wings and Wing-Body Combination in Oscillatory Motion J89-262 Computation of Unsteady Laminar Boundary Layers Subject to Traveling-Wave Freestream Fluctuations J89-252

Use of the Kirchhoff Method in Acoustics

J89-223

Unsteady Vortical Distrubances Around a Thin Airfoil in the Presence of a Wall

Spatiotemporal Adaptation Algorithm for Two-Dimensional Reacting Flows 189-211 Inviscid, Unsteady, Transonic Axisymmetric Flow in Nozzles with Shock Waves

Vortical Patterns in the Wake of an Oscillating Airfoil

J89-181

J89-181

Effects of Transverse Curvature on Oscillatory Flow Along a Circular Cylinder

Investigation of the Flow Structure Around a Rapidly Pitching Airfoil J89-154 Unsteady Transonic Airfoil Computation

Unsteady Transonic Airfoil Computation
Using Implicit Euler Scheme on BodyFixed Grid J89-152

Viscous Aerodynamic Analysis of an Oscillating Flat-Plate Airfoil J89-150 Variations of Undamped Rotor Blade Frequencies Subjected to Transient Heat Flux

Calculation of Unsteady Flows in Turbomachinery Using the Linearized Euler Equations J89-109

Separation Shock Motion in Fin, Cylinder, and Compression Ramp--Induced Turbulent Interactions J89-103

Potential Flow Over Bodies of Revolution in Unsteady Motion J89-102 Blade-Vortex Interaction J89-097

Extension and Application of Flux-Vector Splitting to Calculations on Dynamic Meshes J89-093

Unsteady Pressure Distribution Over a Pitching Airfoil

September of Oscillating

Computational Aerodynamics of Oscillating
Cascades with the Evolution of Stall

Oscillating Incompressible Aerodynamics of a Loaded Airfoil Cascade J89-061 Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors

Fluctuating Flow Due to Unsteady Rotation of a Disk J89-024

## Viscous Non-boundary-Layer Flows

Unstable Vortices in the Near Region of a Internal Flow Cavity J89-263 Surface Curvature Effect on the Calculation of Separation Bubble J89-192

Computational Analysis of Three-Dimensional Turbulent Flow Around a Bluff Body in Ground Proximity J89-183

Mass Transfer in a Binary Gas Jet J89-168 Computational/Experimental Study of the Flowfield on a Body of Revolution at Incidence J89-147 Numerical Solution of Navier-Stokes Equa-

tions for Two-Dimensional Viscous Compressible Flows J89-123
Separating Flow Over Repeated Surface-

Separating Flow Over Repeated Surface-Mounted Ribs in a Square Duct J89-108 Aero-Optical Analysis of Compressible Flow Over an Open Cavity J89-106

Development of a Viscous Cascade Code Based on Scalar Implicit Factorization

Calculation of Planar and Conical Diffuser Flows J89-073

Computations of Supersonic Flows Over a Body at High Angles of Attack J89-059 Combined LDV and Rayleigh Measurements in a Complex Turbulent Mixing Flow J89-015

Influence of Initial and Boundary Conditions on Vortex Ring Development J87-064

#### Vortices

Calculation of Asymmetric Vortex Separation on Cones and Tangent Ogives Based on Discrete Vortex Model J89-281 Unstable Vortices in the Near Region of a Internal Flow Cavity J89-263 Separation Control on an Airfoil by Periodic Forcing J89-115

## Wave Motion and Sloshing

Nonlinear Fluid Slosh Coupled to the Dynamics of a Spacecraft J89-185
Computation of Highly Swirling Confined
Flow with a Reynolds Stress Trublence
Model J89-008

## Guidance, Control, and Dynamics Technology

## Aircraft Stability and Control

Integrated Approach for Active Coupling of Structures and Fluids J89-110

## **Control System Design**

Effects of a Piezo-Actuator on a Finitely
Deformed Beam Subjected to General
Loading J89-287

## **Dynamics**

Optimum Design of Systems for Dynamics and Controls Using Sequential Quadratic Programming J89-286

## Software Technology

New Approximation Method for Stress Constraints in Structural Synthesis J89-047

#### Spacecraft Dynamics

Free Rotation of a Circular Ring with an Unbalanced Mass J89-255 Nonlinear Fluid Slosh Coupled to the Dynamics of a Spacecraft J89-185 Eigenvector Derivatives with Repeated Eigenvalues J89-066

## Spacecraft Guidance and Control

Eigenvector Derivatives with Repeated Eigenvalues J89-066

## Structural Control

Sensitivity of Actively Damped Structures to Imperfections and Modeling Errors J89-220

## System Identification

Parameter Identification of Discrete-Time Series Models for Structural Response Prediction J89-251 Noise Bias in Various Formulations of Ibrahim's Time Domain Technique

J89-172
Identification of Dynamic Green's Functions in Structural Networks J89-067

## **Interdisciplinary Topics**

## **Analytical and Numerical Methods**

Buckling and Vibration of Laminated Composite Plates Using Various Plate Theories Free Rotation of a Circular Ring with an Unbalanced Mass J89-255
Method for Nonlinear Optimization with Discrete Design Variables J89-244
Generalized Method of Predicting Optimal Performance of Active Noise Controllers

Calculation of Transonic Flows Over Bodies of Varying Complexity Using Slender Body Theory J89-184

Coupled Thermoelasticity Beam Problems J89-091

Identification of Dynamic Green's Functions in Structural Networks J89-067
Flow Around Simply and Multiply Connected Bodies: A New Iterative Scheme for Conformal Mapping J89-046
Numerical Verification of Design Sensitivity
Analysis J89-019
Shape Optimal Design Using Fictition

## Atmospheric and Space Sciences

Induced Emission of Radiation from a Large Space-Station-Like Structure in the Ionosphere J89-060

## Lasers and Laser Applications

Time-Dependent Analysis of an N<sub>2</sub>O Gasdynamic Laser J89-213
Parametric Study of Statistical Bias in Laser
Doppler Velocimetry J89-171
Skin-Friction Measurements by Laser-Beam Interferometry J89-143
Aero-Optical Analysis of Compressible Flow Over an Open Cavity J89-106
Laser-Induced Iodine Fluorescence Technique for Quantitative Measurement in a Nonreacting Supersonic Combustor

Optical Boundary-Layer Transition Detection in a Transonic Wind Tunnel

Short Wavelength Chemical Lasers J89-069
Entropy Production in Nonsteady General
Coordinates J87-279

## Research Facilities and Instrumentation

Parametric Study of Statistical Bias in Laser Doppler Velocimetry J89-171

## Sensor Systems

Aero-Optical Analysis of Compressible Flow Over an Open Cavity J89-106 Improved Method of Analyzing Hot-Wire Measurements in Supersonic Turbulence

## Launch Vehicle and Missile (LV/M) Technology

## Aerodynamics

Direct Simulation of Three-Dimensional Hypersonic Flow About Intersecting Blunt Wedges J89-238 Wakes of Four Complex Bodies of Revolution at Zero Angle of Attack J89-099 Viscous Drag Reduction of a Nose Body

## Configurational Design

Penetration and Ricochet Phenomena in Oblique Hypervelocity Impact J89-085

#### Vibration

New Concepts for Finite-Element Mass Matrix Formulations J89-187 Accurate Analytical Solution for Free Vibration of the Simply Supported Triangular Plate J89-086

## Propulsion

## **Airbreathing Propulsion**

Modeling of Liquid Jets Injected Transversely into a Supersonic Crossflow J89-270

Computation of Unsteady Laminar Boundary Layers Subject to Traveling-Wave Freestream Fluctuations J89-252 Experimental Comparison of Two Hot-Wire Techniques in Supersonic Flow J89-158 Development of a Viscous Cascade Code Based on Scalar Implicit Factorization

Laser-Induced Iodine Fluorescence Technique for Quantitative Measurement in a Nonreacting Supersonic Combustor

Design of Airfoils and Cascades of Airfoils

J89-062

Oscillating Incompressible Aerodynamics of a Loaded Airfoil Cascade J89-061 Subcritical Swirling Flows in Convergent, Annular Nozzles J89-028

## Combustion and Combustor Designs

Progress in Direct Numerical Simulations of Turbulent Reacting Flows J89-239
Combustion-Related Shear-Flow Dynamics in Elliptic Supersonic Jets J89-208
Linear Instability Waves in Supersonic Turbulent Mixing Layers J89-095
Experimental and Numerical Study of Confined Coaxial Turbulent Jets J89-072

## **Engine Performance**

Diffuser Performance of Two-Stream Supersonic Wind Tunnels J89-166 Probabilistic Structural Analysis to Quantify Uncertainties Associated with Turbopump Blades J89-113 Transitional Flow on Axial Turbomachine Blading J89-079

#### **Environmental Effects**

Motion and Deformation of Very Large Space Structures J89-051

#### Injector Design and Characterization

Structure and Mixing Properties of Pressure-Atomized Sprays J89-131

## Ramjets and Scramjets

Modeling of Liquid Jets Injected Transversely into a Supersonic Crossflow

#### Space Technology

#### Space Systems

Direct Simulation of Three-Dimensional Hypersonic Flow About Intersecting Blunt Wedges J89-238 Fluctuation of Heat Transfer in Shock Wave/Turbulent Boundary-Layer Interaction J89-055

## Spacecraft Structural Configuration, Design, and Analysis

Integrated Structural Electromagnetic Shape Control of Large Space Antenna Reflectors J89-114

## Structural Mechanics and Materials

## Aeroelasticity and Control

Optimum Design of Systems for Dynamics and Controls Using Sequential Quadratic Programming J89-286

Calculation of Unsteady Flows in Turbomachinery Using the Linearized Euler Equations J89-109

Computational Aerodynamics of Oscillating Cascades with the Evolution of Stall

Oscillating Incompressible Aerodynamics of a Loaded Airfoil Cascade J89-061
Control of Flexible Structures by Applied Thermal Gradients J87-150

#### **Dynamic Model Analysis**

Power Law and Fractional Calculus Model of Viscoelasticity J89-217 How Gravity and Joint Scaling Affect Dynamic Response J89-191 Epicyclic Gear Dynamics J89-080

## Flexible and Active Structures

Effects of a Piezo-Actuator on a Finitely
Deformed Beam Subjected to General
Loading J89-287

Sensitivity of Actively Damped Structures to Imperfections and Modeling Errors

Optimal Location of Actuators for Correcting Distortions in Large Truss Structures

Continuum Modeling of Flexible Structures with Application to Vibration Control

Effects of Transverse Shearing Flexibility on Postbuckling of Plates in Shear J89-087

#### **Materials Structural Properties**

Stochastic Approach to Modeling Fatigue
Crack Growth
Power Law and Fractional Calculus
of Viscoelasticity
Comparison of the Notched Fatigue Life of
Ti-10V-2Fe-3A1 and Ti-6A1-4V
J89-111

## Structural Composite Materials

Buckling and Vibration of Laminated Composite Plates Using Various Plate Theories

Postbuckling Behavior of Laminated Plates
Using a Direct Energy-Minimization Technique
J89-285

Vibration Analysis of Composite Turbopropellers Using a Nonlinear Beam-Type Finite-Element Approach J89-247

Closed-Form Solutions for Arbitrary Laminated Anisotropic Cylindrical Shells (Tubes) Including Shear Deformation 189.246

Transient Response of Graphite/Epoxy and Kevlar/Epoxy Laminates Subjected to Impact J89-245

Impact J89-245
Method for Nonlinear Optimization with
Discrete Design Variables J89-244

Degradation of Mechanical Properties of Advanced Composites Exposed to Aircraft Environment J89-215

Buckling and Postbuckling of Laminated Composite Plates with Ply Doppoffs

Vibrational Characteristics of Composites
Panels with Cutouts
Flutter Analysis of Cantilever Composite
Plates in Subsonic Flow
J89-214
J89-214
J89-214

Response of Moderately Thick Laminated Cross-Ply Composite Shells Subjected to Random Excitation J89-141 Two-Mode Nonlinear Vibration of Ortho-

tropic Plates Using Method of Multiple Scales J89-139

Nonlinear Forced Vibration of Orthotropic Rectangular Plates Using the Method of Multiple Scales J89-138

Recent Advances in Analysis of Laminated Beams and Plates Part II: Vibrations and Wave Propagation J89-136

Recent Advances in Analysis of Laminated Beams and Plates Part I: Shear Effects and Buckling J89-135 Mixed Finite-Element Method for Compos-

ite Cylinder Subjected to Impact 189-084 Large Deformation Effects in the Postbuckling Behavior of Composites with Thin Delaminations 189-083

Composite Laminate Free-Edge Reinforcement with U-Shaped Caps Part II: Theoretical-Experimental Correlation J89-082 Beam-Like Bending of Variable-Thickness

Sandwich Plates J89-068
Compressive Deformation of Embedded
High-Performance Polymeric Fibers

Flexural Behavior of a Rotating Sandwich
Tapered Beam J89-048

Continuum-Based Stiffened Composite Shell
Element for Geometrically Nonlinear
Analysis J89-013
Effect of Ply Stacking Sequence on Stress in

# a Scarf Joint Structural Design

Postbuckling Behavior of Laminated Plates Using a Direct Energy-Minimization Technique J89-285

Integrated Nonlinear Structural Analysis and Design J89-249

Semianalytical Structure Sensitivity Formulation in Boundary Elements 189-248 Method for Nonlinear Optimization with Discrete Design Variables 189-244

Equivalence of Continuum and Discrete Methods of Shape Design Sensitivity Analysis J89-218

How Gravity and Joint Scaling Affect Dynamic Response J89-191 Failure of Compression-Loaded Multidirec-

tional Composite Laminates J89-190
Shape Optimization of Three-Dimensional
Continuum Structures via Force Approximation Techniques J89-188

Vibrational Characteristics of Composites
Panels with Cutouts

J89-164

Parallelism in the Solution of Large Full Linear Systems Using a Matrix Partition Approach J89-118

Probabilistic Structural Analysis to Quantify Uncertainties Associated with Turbopump Blades J89-113

Comparison of the Notched Fatigue Life of Ti-10V-2Fe-3Al and Ti-6Al-4V J89-111 Penetration and Ricochet Phenomena in

Oblique Hypervelocity Impact J89-085 Large Deformation Effects in the Postbuckling Behavior of Composites with Thin

Delaminations J89-083
Thermal-Stress-Free Fasteners for Joining
Orthotropic Materials J89-064
New Approximation Method for Stress Con-

straints in Structural Synthesis J89-047
Strong Mode Localization in Nearly Periodic
Disordered Structures J89-033

Numerical Verification of Design Sensitivity
Analysis J89-019

Shape Optimal Design Using Fictitious Loads

Effect of Ply Stacking Sequence on Stress in a Scarf Joint

J89-011

J89-011

# Structural Durability (including Fatigue and Fracture, and Environmental Degradation)

Stochastic Approach to Modeling Fatigue Crack Growth J89-250

Failure of Compression-Loaded Multidirectional Composite Laminates J89-190 Comparison of the Notched Fatigue Life of Ti-10V-2Fe-3A1 and Ti-6A1-4V J89-111

Integrated Approach for Active Coupling of Structures and Fluids J89-110 Semi-Analytical Finite-Element Study for

Elastomeric Composite Solids of Revolution J89-012 Stresses and Rate of Twist in Single-Cell

Thin-Walled Beams with Anisotropic Walls

Stresses and Rate of Twist in Single-Cell Maintenance of Twist in Single-Cell Thin-Walled Beams with Anisotropic Walls

## Structural Dynamics and Characterization

Free Rotation of a Circular Ring with an Unbalanced Mass J89-255

Parameter Identification of Discrete-Time Series Models for Structural Response Prediction J89-251

Vibration Analysis of Composite Turbopropellers Using a Nonlinear Beam-Type Finite-Element Approach J89-247

Sensitivity of Actively Damped Structures to Imperfections and Modeling Errors

Dynamic Analysis for Free Vibrations of Rotating Sandwich Tapered Beams 389-219 Nonlinear Free Flexural Vibration of Thin Circular Cylindrical Shells J89-198

How Gravity and Joint Scaling Affect Dynamic Response J89-191

Continuum Modeling of Flexible Structures with Application to Vibration Control

Nonlinear Fluid Slosh Coupled to the Dynamics of a Spacecraft J89-185 Noise Bias in Various Formulations of Ibrahim's Time Domain Technique

Vibrational Characteristics of Composites
Panels with Cutouts

J89-164

Experimental Identification of Modal Momentum Coefficients and Modal Identity
Parameters J89-161

Response of Moderately Thick Laminated Cross-Ply Composite Shells Subjected to Random Excitation J89-141

Two-Mode Nonlinear Vibration of Orthotropic Plates Using Method of Multiple Scales J89-139

Nonlinear Forced Vibration of Orthotropic Rectangular Plates Using the Method of Multiple Scales J89-138

Accurate Calculation of Control-Augmented Structural Eigenvalue Sensitivities Using Reduced-Order Models J89-137

Reduced-Order Models J89-137
Probabilistic Structural Analysis to Quantify
Uncertainties Associated with Turbopump

Blades J89-113
Nonlinear Free Vibration of Elastic Plates
189-992

Coupled Thermoelasticity Beam Problems
J89-091

Accurate Analytical Solution for Free Vibration of the Simply Supported Trian-

gular Plate J89-086
Identification of Dynamic Green's Functions
in Structural Networks J89-067

Eigenvector Derivatives with Repeated Eigenvalues

Motion and Deformation of Very Large Space Structures

Strong Mode Localization in Nearly Periodic Disordered Structures

J89-031

Nonlinear Vibrations of Unsymmetrically

Laminated Beams J89-030
Analysis of Structures with Rotating, Flexible Substructures Applied to Rotocraft

Aeroelasticity J89-029
Mass Matrix Modification Using Element
Correction Method J89-020

Green's Function and Receptance for Structures Consisting of Beams and Plates

Control of Flexible Structures by Applied
Thermal Gradients J87-150
Equilibrium Configurations and Energies of
the Rotating Elastic Cable in Space

## Structural Finite Elements

Buckling and Vibration of Laminated Composite Plates Using Various Plate Theories

Equivalence of Continuum and Discrete Methods of Shape Design Sensitivity Analysis J89-218

## Structural Modeling

Refinement of Higher-Order Laminated Plate Theories J89-289
Parameter Identification of Discrete-Time Series Models for Structural Response Prediction J89-251
Semianalytical Structure Sensitivity Formulation in Boundary Elements J89-248
Transient Response of Graphite/Epoxy and Kevlar/Epoxy Laminates Subjected to Impact J89-248

Transverse Shear Deformation in Orthotropic Cylindrical Pressure Vessels Using a Higher-Order Shear Theory J89-221 Power Law and Fractional Calculus Model of Viscoelasticity J89-217

Recent Advances in Analysis of Laminated Beams and Plates Part II: Vibrations and Wave Propagation J89-136

Recent Advances in Analysis of Laminated Beams and Plates Part I: Shear Effects and Buckling J89-135

## Structural Optimization

Integrated Nonlinear Structural Analysis and Design J89-249
Semianalytical Structure Sensitivity Formulation in Boundary Elements J89-248
Equivalence of Continuum and Education Methods of Shape Design Sensitivity Analysis J89-218

#### Structural Stability

Delaminations

Postbuckling Behavior of Laminated Plates Using a Direct Energy-Minimization Technique J89-285

Stability of a Viscoelastic Rotor-Disk System under Dynamic Axial Loads J89-256
Buckling and Postbuckling of Laminated Composite Plates with Ply Dropoffs

Nonisothermal Elastoviscoplastic Snap-Through and Creep Buckling of Shallow Arches J89-163 Transverse Vibrations of a Trapezoidal Can-

tilever Plate of Variable Thickness

J89-134

Effects of Transverse Shearing Flexibious

Postbuckling of Plates in Shear J89-087

Large Deformation Effects in the Postbuck-

ling Behavior of Composites with Thin

Bifurcation Buckling of Circular Cylindrical Shells Under Uniform External Pressure

Accurate Rigid-Body Modes Representation for a Nonlinear Curved Thin-Shell Element J89-031

Continuum-Based Stiffened Composite Shell Element for Geometrically Nonlinear Analysis J89-013

#### Thermal Effects

Closed-Form Solutions for Arbitrary Laminated Anisotropic Cylindrical Shells (Tubes) Including Shear Deformation

Shape Optimization of Three-Dimensional
Continuum Structures via Force Approximation Techniques
J89-240

J89-240

Shape Optimization of Three-Dimensional
Continuum Structures via Force Approximation Techniques
J89-240

Beam-Like Bending of Variable-Thickness
Sandwich Plates
Thermal-Stress-Free Fasteners for Joining

Orthotropic Materials
Localization of Vibrations in Large Space
Reflectors
J89-032

Accurate Rigid-Body Modes Representation for a Nonlinear Curved Thin-Shell Element 389-031

## Thermophysics and Heat Transfer

## **Nonintrusive Diagnostics**

Laser-Induced Iodine Fluorescence Technique for Quantitative Measurement in a Nonreacting Supersonic Combustor

Fluctuation of Heat Transfer in Shock Wave/Turbulent Boundary-Layer Interaction J89-655

# **Author Index**

Abbott, D. E., J89-023 Abdol-Hamid, K. S., J89-042 Abe, M., J89-025 Abu-Arja, K. R., J89-246 Adelman, H. M., J89-114 Ahmadi, G., J87-265 Aika, S., J89-262 Aithal, R., J89-248 Ajmani, K., J89-209 Alves, Carlos F. E., J89-195 Amberg, T., J89-225 Anderson, W. K., J89-093 Andoh, S., J89-007, J89-153 Andreopoulos, J., J89-126 Antonia, R. A., J89-231 Anzhong, T., J89-055 Ardonceau, P. L., J89-090 Argrow, B. M., 187-279 Arora, J. S., J89-019, J89-286 Artley, M. E., J89-250 Ashmawey, M. F., J89-193 Aso, S., J89-055 Atassi, H. M., J89-222 Atli, V., J89-099 Atluri, S. N., J89-287 Auerbach, D. E., J87-064 Azzazy, M., J89-056 Bachrach, W. E., J89-084 Bac, Y., J89-177 Bagley, R. L., J89-217 Bahree, R., J89-112 Bai, S. J., 189-065 Bailey, M. C., J89-114 Bandyopadhyay, P. R., J89-037 Bar-Sever, A., J89-115

Barnwell, R. W., J89-002, J89-268 Baron, J. R., J89-005, J89-211 Bastos-Netto, D., J89-195 Basu, B. C., J89-262 Batill, S. M., J89-172, J89-251 Baysal, O., J89-059 Beckwith, I. E., J89-096 Belegundu, A. D., J89-014 Bell, J. H., J89-050 Bendiksen, O. O., J89-032 Bennett, W. H., J89-189 Bernard, P. S., J89-193 Bernhard, R. J., J89-228 Bertin, J. J., J89-186 Bhaskar, K., J89-289 Bhat, R. B., J89-134 Bicos, A. S., J89-164 Bielak, J., J89-191 Bird. G. A., J89-238 Blackwelder, R. F., J89-041 Blosser, M. L., J89-064 Bogdanoff, D. W., J89-132 Botta, N., J89-039 Boyd, L. S., J89-080 Boyer, R. R., J89-111 Brackett, D. C., 189-132 Brand, A. G., J89-076 Bridges, D. H., J89-197 Brown, W. H., J89-100 Brusniak, L., J89-103 Buck, M., J89-043 Bullock, K. J., J89-038 Burdisso, R. A., J89-216 Busnaina, A. A., J87-265 Bustamante, A. C., J89-186

Caille, J., J89-160 Cairns, D. S., J89-245 Carasso, A. S., J89-067 Carpenter, P. W., J89-028 Carter, J. E., J89-130 Cassady, P. E., J89-106 Castro, I. P., J89-101 Catalano, G. D., J89-237 Caughey, D. A., J89-016 Cebeci, T., J89-088, J89-125, J89-127, J89-265 Cederbaum, G., J89-141 Celenligil, M. C., J89-238 Cha, P. D., J89-033 Chakrabartty, S. K., J89-123 Chamis, C. C., J89-113 Chandrasekharappa, G., J89-092 Chang, K. S., J89-237 Chapman, G. T., J89-197 Chaudhuri, R. A., J89-246 Chausee, D. S., J89-178 Chen, F. -J., J89-096 Chen, L., J89-212 Chen, L. -D., J89-233, J89-234 Chew, Y. T., J89-170 Chiang, H. D., J89-061 Chima, R. V., J89-104 Chin, S., J89-281 Choi. D., J89-078 Choi. D. H. 189-192 Choi, K. K., J89-218 Chowdhury, S. J., J87-265 Christiansen, W. H., J89-273 Chua, L. P., J89-231 Chuang, H. A., J89-152

Chuech, S. G., J89-074 CHung, M. K., J87-174 Chung, M. K., J89-045 Chung, T. J., J89-044 Cimbala, J. M., J89-117 Clinkemaillie, J., J89-187 Cornwell, P. J., J89-032 Crawley, E. F., J89-109, J89-185 Crepeau, J. C., J89-263 Crighton, D. G. J89-179 Dadone, L., J89-097 Dailey, R. L., J89-066 Dallmann, U., J89-182 Dang, T. Q., J89-212 Davis, D. O., J89-151 Davis, R. L., J89-130 de Groot, W. A., J89-015 Degani, D., J89-003 DeJarmette, F. R., J89-268 DeJarnette, F. R., J89-002 Denison, M. K., J89-263 Dennis, S. T., J89-221 Dianat, M., J89-101 Dimotakis, P. E., J89-026 DiNardo, M. T., J89-214 Dinyavari, M. A. H., J89-035 Disimile, P. J., J89-282 Doerffer, P., J89-182 Dolling, D. S., J89-103, J89-267 Dress, D. A., J89-159 Driver, D. M., J89-266 Dubois, J., J89-187 Dugundji, J., J89-285 Dussauge, J. P., J89-126 Dutt, H. N. V., J89-089

Dwyer, H., J89-049 Eberhardt, S., J89-277 Edberg, D. L., J87-150 Egan, D. A., J89-127 Eidelman, S., J89-241 El-Hawary, M. M., J89-012 Elbanna, H., J89-058 Elishakoff, I., J89-141 Emanuel, G., J87-279, J88-105, 189-177 Ericsson, L. E., J89-254 Eslami, H., J89-138, J89-139 Fslami, M. R. . 189-091 Evans, R. L., J89-252 Ewald, B., J89-107 Faeth, G. M., J89-074, J89-131 Farokhi, S., J89-098 Feyzi, F., J89-143 Fleeter, S., J89-061, J89-150 Fletcher, D. G., J89-077 Floryan, J. M., J89-017 Foss, J. F., J89-094 Foss, J. K., J89-094 Fouladi, K., J89-059 Friedmann, P. P., J89-035, J89-247 Frieler, C. E., J89-272 Fujii, K., J89-176 Fuller, C. R., J89-124, J89-270 Gad-el-Hak, M., J89-041 Gai, S. L. J89-133 Gainer, T. G., J89-281 Galperin, B., J89-105 Garcia-Fogeda, P., J89-102 Garris, C. A., J87-064 Gebert, G. A., J89-222 George, A. R., J89-223 Gessner, F. B., J87-174, J89-151 Gilbert, B., J89-006 Gill, S. J., J89-111 Glegg, S. A. L., J89-279 Gorman, D. J., J89-086 Gossard, T., Jr., J89-081, J89-082 Gould, R. D., J89-171 Griffin, J. H., J89-191 Grossman, B., J89-071 Guo-hua, D., J89-204 Guruswamy, G. P., J89-110 Gutierrez, R. H., J89-134 Gutmark, E., J89-057, J89-208 Haase, W., J89-001 Hadden, L. L., J89-232 Hafez, M., J89-130, J89-226 Haftka, R. T., J89-114, J89-216, J89-220, J89-249 Hall, K. C., J89-109 Hall, R. M., J89-056 Han, T., J89-183 Handler, R. A., J89-193 Hansen, R. S., J89-084 Hansman, R. J., J89-185 Hartsfield, B. W., J89-236 Hastings, D. E., J89-060 Hayashi, M., J89-055 Hebbar, S. K., J89-266 Heister, S. D., J89-270 Herrmann, L. R., J89-012 Hintz, R. M., J89-118 Hodges, D. H., J89-029 Hogg, S., J89-608 Holden, M. S., J89-240 Hollkamp, J. J., J89-172, J89-251 Hong, Y., J89-108 Hopkins, A. S., J89-029 Horn, W. J., J89-215 Howard, W. E., J89-081, J89-082 Hsiao, F., J89-021 Hsieh, S., J89-108 Hsu, S. T., J89-191 Hwang, B. C., J89-073 Hwang, C. J., J89-122

Im, S., J89-287 Inoue, O., J89-235 Irdmusa, J.Z., J87-064 Isaacson, L. K., J89-263 Itabashi, A., J89-025 Iyer, R. K., J89-016 Jagoda, J. I., J89-015 Jayachandran, T., J89-196 Jeffers, W. Q., J89-009 Johnson, C. L., J89-011 Jones, J. D., J89-124 Jones, R. M., J89-081, J89-082 Jonnavithula, S., J89-063 Jorgenson, P. C. E., J89-104 Jou, W., J89-053 Jou, W.-H., J89-239 Kallinderis, Y. G., J89-005 Kandil, O. A., J89-138, J89-139, J89-152 Kane, J. H., J89-248 Kang, D. J., J89-192 Kantha, L. H., J89-105 Kapania, R. K., J89-030, J89-031, J89-135, J89-136, J89-220 Karagozian, A. R., J89-270 Kardomateas, G. A., J89-083 Katz, J., J89-165 Kaya, M. O., J89-253 Keefer, D., J89-283 Keith, W. L., J89-280 Kelkel, K., J87-251 Keller, R. L., J89-065 Kelly, D. P., J89-186 Khdeir, A. A., J89-288 Khodadadi, J. M., J89-072 Kim, J., J89-157 Kim, K. Y., J87-174 Kim, Y. M., J89-044 Kimura, T., J89-243 Klopfer, G. H., J89-227 Knight, C. J., J89-078 Knowles, K., J89-028 Ko, C. L., J89-048, J89-219 Ko, N. W. M., J89-069 Kodiyalam, S., J89-188 Koenig, K., J89-197 Koga, T., J89-034 Kollmann, W., J89-155 Komerath, N. M., J89-076 Koochesfahani, M. M., J89-026, J89-181, J89-272 Korakianitis, T. P., J89-062 Korczak, K. Z., J89-274 Koshigoe, S., J89-057, J89-208 Kosmatka, J. B., J89-247 Kronauer, R. E., J89-038 Kunz. D. L., 189-029 Kwatny, H. G., J89-189 Lagace, P., J89-285 Lagace, P. A., J89-214, J89-245 Lai, J. C. S., J89-038 Lai, Y. G., J89-073 Lam, K. M., J89-069 Lan, C. E., J89-281 Lardner, T. J., J89-051 Launder, B. E., J89-205 Laura, P. A. A., J89-134 Lawerence, S. L., J89-178 Lederman, S., J89-010 Lee, C. S., J89-146 Lee. L. 189-054 Lepicovsky, J., J89-100 Leschziner, M. A., J87-174, J89-008 Letcher, J. S., Jr., J89-149 Liao, C. L., J89-013 Libove, C., J88-179, J89-068 Librescu, L., J89-141 Lick, W. J., J89-184 Lin, K., J89-162 Ling, R. T., J89-036

Liou, M., J88-105 Liu, C., J89-021 Liu, C. Y., J89-170 Liu, D. D., J89-102 Liu, J. L., J89-122 Livne, E., J89-137 Logan, P., J89-018 Lu, C., J89-068 Lu, P., J89-162 Luchini, P., J89-046 Lutz, S. A., J89-116 Lyons, P. R. A., J89-133 Lyrintzis, A. S., J89-223 Makita, H., J89-025 Malik, M. R., J89-096, J89-230 Malla, R. B., J89-051 Malmuth, N. D., J89-184 Mansour, N. N., J89-157 Manzo, F., J89-046 Martinuzzi, R., J89-004, J89-269 Masuda, W., J89-007, J89-153 Mathis, J. A., J89-237 McAninch, G. L., J89-229 McDaniel, J. C., J89-077 McDonell, V. G., J89-027 McGregor, W. K., J89-236 McMahon, H. M., J89-076 McMaster, D. L., J89-043 McMurtry, P., J89-277 Mehta, R. C., J89-196 Mehta, R. D., J89-050 Mikkelsen, C. D., J89-060 Miller, D. S., J89-059 Minguet, P. J., J89-285 Modarress, D., J89-056 Moin, P., J89-157 Molo, C. G., J89-228 Mongia, H. C., J89-027 Montagné, J.-L., J89-207 Mook, D. J., J89-140 Morimatsu, S., J89-034 Moss, J. N., J89-238 Mostafa, A. A., J89-027 Muck, K. C., J89-126 Mueller, T. J., J89-145 Müller, B., J89-121 Müller, T., J89-167 Müller, U. R., J89-143 Murman, E. M., J89-142 Myers, M. K., J89-229 Nagpal, V. K., J89-113 Nan, X., J89-204 Narayan, K. A., J89-024 Nash, W. A., J89-051 Newsome, R. W., J89-264 Ng, W. F., J89-158, J89-209 Nghiem, C. P., J89-278 Nguyen, T. T., J89-270 Nishio, M., J89-243 Nixon, D., J89-227 Norstrud, H., J89-278 Olsen, G. R., J89-244 Ostowari, C., J89-232 Ötügen, M. V., J89-168 Oyibo, G. A., J89-242 Özcan, O., J89-253 Padula, S. L., J89-114 Page, R. H., J89-232 Palazotto, A. N., J89-065, J89-221 Pandolfi, M., J89-039 Papamoschou, D., J89-166 Parameswaran, S., J89-194 Park, C. J., J89-233, J89-234 Park, S. W., J89-045 Park, W. J., J89-117 Parry, A. B., J89-179 Pervaiz, M. M., J89-211 Peterson, L. D., J89-185 Pfeil, H., J89-167, J89-225 Pierre, C., J89-033

Pike, J., J86-362, J89-080 Pletcher, R. H., J89-128 Poling, D. R., J89-097 Pollard, A., J89-004, J89-269 Posillico, C. J., J89-010 Powell, K. G., J89-142 Prathap, G., J89-198 Raciti, S., J89-030, J89-135, J89-136 Radhakrishnan, V., J89-024 Ragab, S. A., J89-095 Rajagopal, K., J89-184 Rajan, S. D., J89-014 Ramani, H. V., J89-198 Rao, K. V., J89-128 Rasmussen, M. L., J87-279 Reddy, J. N., J89-013, J89-288 Reddy, K. P. J., J89-213 Reece, E. W., J89-186 Rhie, C. M., J89-148 Rhodes, R., J89-283 Rhodes, R. P., J89-236 Rice, E. J., J89-098 Riff. R., J89-163 Riley, J. J., J89-239 Riley, J. R., J89-277 Rizzi, A., J89-121 Roberds, D. W., J89-236 Roberts, L., J89-146, J89-156 Rodman, L. C., J89-156 Rothmayer, A. P., J89-180 Rubinstein, R., J89-113 Ruff, G. A., J89-131 Rumsey, C. L., J89-093 Sabbagh, J. A., J89-058 Sagar, A. D., J89-131 Sahu, J., J89-022 Saigal, S., J89-031, J89-248 Salajegheh, E., J89-047 Samuelsen, G. S., J89-027 Sassa, K., J89-025 Scaggs, N., J89-043 Scaggs, N. E., J89-282 Schadow, K. C., J89-057, J89-208 Scharnhorst, R. K., J89-023 Schetz, J. A., J89-160 Schiff, L. B., J89-176 Schmidt, G. S., J89-145 Schonberg, W. P., J89-085 Schroeder, L. M., J89-150 Schulz, R. J., J89-236 Selig, M. S., J89-126 Shaikh, F. M., J89-215 Shang, J. S., J89-043, J89-154 Sharan, A. M., J89-112 Sharp, H. T., J89-206 Shima, N., J89-205 Shinn, J. L., J89-040 Shirazi, S. A., J89-075 Shuart, M. J., J89-190 Shuen, J. S., J89-275 Simiu, E., J89-067 Singh, N., J89-262 Singh, P., J89-024 Sinha, S. K., J89-256 Sirovich, L., J89-206 Sisto, F., J89-063 Smith, D. R., J89-267 Smith, T. D., J89-036 Smits, A. J., J89-003, J89-126 So, R. M. C., J89-073, J89-168 Soeganto, A., J89-215 Soetrisno, M., J89-277 Soucy, Y., J89-161 Spalart, P. R., J89-094 Spencer, B. F., Jr., J89-250 Springer, G. S., J89-164 Srirangarajan, H. R., J89-092 Stalker, R. J., J89-276 Stavrinidis, C., J89-187 Steele, T., J89-161

Steger, J. L., J89-128 Stein, M., J89-087 Stetson, K. F., J89-169 Stevenson, W. H., J89-171 Stock, H. W., J89-001 Su. Y., J89-284 Taghavi, R., J89-098 Tang, J., J89-250 Tang, Z., J89-021 Tannehill, J. C., J89-178 Tarada, F., J87-265 Tarn, J., J89-162 Tavell, D., J89-146 Taylor, A. C., III, J89-209 Taylor, R. A., J89-085 Tedeschi, W. J., J89-186 Telionis, D. P., J89-097 Terry, P. J., J89-106 Thangam, S., J89-063

Thomas, J. L., J89-093, J89-264 Thompson, H. D., J89-171 Tordella, D., J89-273 Truman, C. R., J89-075 Tsai, W. T., J88-179 Tseng, C. H., J89-019, J89-286 Tubis, A., J89-057 Twu, S., J89-218 Vahedi, H., J89-091 van Dam, C. P., J89-226 Vanderplaats, G. N., J89-047, J89-188, J89-244 Varadan, T. K., J89-198, J89-289 Venkatakrishnan, V., J89-129 Vigneron, F. R., J89-161 Vinokur, M., J89-207 Visbal, M. R., J89-154 Vlachos, N. S., J89-072

Wahls, R. A., J89-002, J89-268 Walker, D. A., J89-158 Walker, G. J., J89-079 Walker, J. D. A., J89-023 Walker, M. D., J89-158 Walterick, R. E., J89-015 Walters, R. W., J89-071 Wang, C. Y., J86-362, J89-255 Wang, J., J89-060 Watson, L. T., J89-255 Wei, F., J89-020 Weigand, G. G., J89-023 Wessel, R. A., J89-274 Wiedemann, J., J89-107 Wieting, A. R., J89-240 Willshire, W. L., Jr., J89-070 Wilmoth, R. G., J89-042 Wilson, K. J., J89-208

Wlezien, R. W., J89-210 Wood, N. J., J89-146, J89-156 Wu, A., J89-155 Wu, J. L., J89-095 Wu, M., J89-102 Wu, W., J89-063 Xie-yuan, Y., J89-204 Yam, C., J89-049 Yang, T. Y., J89-031 Yee, H. C., J89-040, J89-207 Yili, L., J89-224 Yoder, G. R., J89-111 Yoon, S., J89-275 Yu, L., J89-224 Zhang, D., J89-020 Zhu, J. Y., J89-168 Zilliac, G. G., J89-147 Zorumski, W. E., J89-070

# **Chronological Index**

J86-362 Equilibrium Configurations and Energies of the Rotating Elastic Cable in Space. C. Y. Wang, *Michigan State University* (24, 12, p. 2010) Article

Technical Comment by J. Pike, Holly Cottage, Chawston, Bedford, England, UK (27, 9, p. 1307)

Reply (27, 9, p. 1307)

J87-064 Influence of Initial and Boundary Conditions on Vortex Ring Development. J.Z. Irdmusa and C. A. Garris, George Washington University (25, 3, p. 371) Synoptic

Technical Comment by David E. Auerbach, Max-Planck-Institute of Fluid Dynamics (27, 8, p. 1145)

J87-150 Control of Flexible Structures by Applied Thermal Gradients. Donald L. Edberg, Jet Propulsion Laboratory, California Institute of Technology (25, 6, p. 877) Article Errata (27, 6, p. 827)

J87-174 New Eddy Viscosity Model of Computation of Swirling Turbulent Flows. Kwang Yong Kim, Inha University, Korea; and Myung Kyoon CHung, Korea Advanced Institute of Science and Technology (25, 7, p. 1020) Technical Note Technical Comment by F. B. Gessner, University of

Washington (27, 9, p. 1305)
Technical Comment by M. A. Leschziner, University of Manchester, England, UK (27, 9, p. 1306)

Reply (27, 9, p. 1306)

J87-251 Green's Function and Receptance for Structures Consisting of Beams and Plates. K. Kelkel, *University of Darmstadt*, FRG (25, 11, p. 1482) Article

Technical Comment by J. W. Nicholson, Shell Development Company, and L. A. Bergman, University of Illinois (27, 3, p. 377)

J87-265 Two-Equation Turbulence Model Consistent with the Second Law. A. A. Busnaina, G. Ahmadi and S. J. Chowdhury, Clarkson University (25, 12, p. 1543) Synoptic Technical Comment by Fathi Tarada, University of Sussex, England, UK (27, 11, p. 1657)
Reply (27, 11, p. 1657)

J87-279 Entropy Production in Nonsteady General Coordinates.
B. M. Argrow, G. Emanuel and M. L. Rasmussen, University of Oklahoma (25, 12, p. 1629) Technical Note Errata (27, 7, p. 986)

J88-105 Solutions of One-Dimensional Steady Nozzle Flow Revisited. Meng-Sing Liou, NASA Lewis Research Center (26, 5, p. 625) Technical Note Technical Comment by George Francel University of

Technical Comment by George Emanuel, University of Oklahoma (27, 8, p. 1145) Reply (27, 8, p. 1145) J88-179 Stresses and Rate of Twist in Single-Cell Thin-Walled Beams with Anisotropic Walls. Charles Libove, Syracuse University (26, 9, p. 1107) Article

Technical Comment by Wan T. Tsai, Rockwell International (27, 11, p. 1658)

J89-001 Determination of Length Scales in Algebraic Turbulence Models for Navier-Stokes Methods. H. W. Stock and W. Haase, *Dornier GmbH*, *FRG* (27, 1, p. 5) Article based on AIAA Paper 87-1302

J89-002 Finite-Difference Outer-Layer, Analytic Inner-Layer Method for Turbulent Boundary Layers. Richard A. Wahls, North Carolina State University; Richard W. Barnwell, NASA Langley Research Center; and Fred R. DeJarnette, North Carolina State University (27, 1, p. 15) Article based on AIAA Paper 87-0429

J89-003 Response of a Compressible, Turbulent Boundary Layer to a Short Region of Surface Curvature. David Degani, Technion-Israel Institute of Technology; and Alexander J. Smits, Princeton University (27, 1, p. 23) Article based on AIAA Paper 85-1667

J89-004 Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow Part I: Algebraic Stress and  $\kappa$ - $\epsilon$  Models. R. Martinuzzi and A. Pollard, *Queen's University, Canada* (27, 1, p. 29) Article

J89-005 Adaptation Methods for a New Navier-Stokes Algorithm. Yannis G. Kallinderis and Judson R. Baron, Massachusetts Institute of Technology (27, 1, p. 37) Article based on AIAA Paper 87-1167 cp874

J89-006 Turbulence Measurements in a Radial Upwash. Barry Gilbert, Grumman Corporate Research Center (27, 1, p. 44) Article based on AIAA Paper 87-1435

J89-007 Effects of Curvature on the Initial Mixing Region of a Two-Dimensional Jet. Wataru Masuda and Shigeo Andoh, Technological University of Nagaoka, Japan (27, 1, p. 52) Article

J89-008 Computation of Highly Swirling Confined Flow with a Reynolds Stress Turbulence Model. S. Hogg and M. A. Leschziner, University of Manchester, England, UK (27, 1, p. 57) Article

J89-009 Short Wavelength Chemical Lasers. William Q. Jeffers, Helios Inc. (27, 1, p. 64) Article

J89-010 Laser Diagnostics of Reacting Stagnation Point Flow. C. J. Posillico and S. Lederman, *Polytechnic University* (27, 1, p. 67) Article

- J89-011 Effect of Ply Stacking Sequence on Stress in a Scarf Joint. Caryl L. Johnson, Structural Dynamics Research Corporation, Inc. (27, 1, p. 79) Article
- J89-012 Semi-Analytical Finite-Element Study for Elastomeric Composite Solids of Revolution. Moetaz M. El-Hawary and Leonard R. Herrmann, *University of California, Davis* (27, 1, p. 87) Article
- J89-013 Continuum-Based Stiffened Composite Shell Element for Geometrically Nonlinear Analysis. C. L. Liao and J. N. Reddy, Virginia Polytechnic Institute and State University (27, 1, p. 95) Article
- J89-014 Shape Optimal Design Using Fictitious Loads. S. D. Rajan, Arizona State University; and A. D. Belegundu, Pennsylvania State University (27, 1, p. 102) Article based on AIAA Paper 88-2300 cp882
- J89-015 Combined LDV and Rayleigh Measurements in a Complex Turbulent Mixing Flow. W. A. de Groot, R. E. Walterick and J. I. Jagoda, Georgia Institute of Technology (27, 1, p. 108) Technical Note based on AIAA Paper 87-1328
- J89-016 Diagonal Implicit Multigrid Calculation of Inlet Flow-fields, D. A. Caughey and R. K. Iyer, Cornell University (27, 1, p. 110) Technical Note
- J89-017 Görtler Instability of Wall Jets. J. M. Floryan, University of Western Ontario, Canada (27, 1, p. 112) Technical Nate
- J89-018 Improved Method of Analyzing Hot-Wire Measurements in Supersonic Turbulence. Pamela I on, University of California, Los Angeles (27, 1, p. 115) Lee al Note
- J89-019 Numerical Verification of Design Sensitivity Analysis. C. H. Tseng and J. S. Arora, *University of Iowa* (27, 1, p. 117) Technical Note
- J89-020 Mass Matrix Modification Using Element Correction Method. Fu-Shang Wei, Kaman Aerospace Corporation; and De-Wen Zhang, Beijing Institute of Structure and Environment, China (27, 1, p. 119) Technical Note
- J89-021 Aerodynamic Performance and Flow Structure Studies of a Low Reynolds Number Airfoil. Fei-Bin Hsiao, Chin-Fung Liu and Zen Tang, National Cheng Kung University, Taiwan, ROC (27, 1, p. 129) Article based on AIAA Paper 87-1267
- J89-022 Three-Dimensional Base-Flow Calculation for a Projectile at Transonic Velocity. Jubaraj Sahu, USA Laboratory Command (27, 2, p. 138) Synoptic
- J89-023 Wall-Layer Model for the Velocity Profile in Turbulent Flows. J. D. A. Walker, Lehigh University; D. E. Abbott, University of Massachusetts at Amherst; R. K. Scharnhorst, McDonnell Aircraft Company; and Gilbert G. Weigand, Sandia National Laboratories (27, 2, p. 140) Article based on AIAA Paper 86-0213
- J89-024 Fluctuating Flow Due to Unsteady Rotation of a Disk. P. Singh, V. Radhakrishnan and K. A. Narayan, *Indian Institute of Technology at Kanpur* (27, 2, p. 150) Article
- J89-025 Decay Process of a Manipulated Large-Scale Horseshoe Vortex in a Turbulent Boundary Layer. H. Makita, K. Sassa, M. Abe and A. Itabashi, *Toyohashi University of Technology, Japan* (27, 2, p. 155) Article based on AIAA Paper 87-1232
- J89-026 Effects of a Downstream Disturbance on the Structure of a Turbulent Plane Mixing Layer. M. M. Koochesfahani and P. E. Dimotakis, California Institute of Technology (27, 2, p. 161) Article based on AIAA Paper 87-0197

- J89-027 Evolution of Particle-Laden Jet Flows: A Theoretical and Experimental Study. A. A. Mostafa and H. C. Mongia, General Motors Corporation; V. G. McDonell and G. S. Samuelsen, University of California, Irvine (27, 2, p. 167) Article based on AIAA Paper 87-2181
- J89-028 Subcritical Swirling Flows in Convergent, Annular Nozzles. K. Knowles, Royal Military College of Science, Shrivenham, UK; and P. W. Carpenter, University of Exeter, Exeter, UK (27, 2, p. 184) Article
- J89-029 Analysis of Structures with Rotating, Flexible Substructures Applied to Rotorcraft Aeroelasticity. Dewey H. Hodges, Georgia Institute of Technology; A. Stewart Hopkins and Donald L. Kunz, NASA Ames Research Center (27, 2, p. 192) Article
- J89-030 Nonlinear Vibrations of Unsymmetrically Laminated Beams. Rakesh K. Kapania and Stefano Raciti, Virginia Polytechnic Institute and State University (27, 2, p. 201) Article based on AIAA Paper 87-0859 CP872
- J89-031 Accurate Rigid-Body Modes Representation for a Nonlinear Curved Thin-Shell Element. T. Y. Yang, Purdue University; Rakesh K. Kapania, Virginia Polytechnic Institute and State University; and Sunil Saigal, Worcester Polytechnic Institute (27, 2, p. 211) Article
- J89-032 Localization of Vibrations in Large Space Reflectors. Phillip J. Cornwell and Oddvar O. Bendiksen, *Princeton University* (27, 2, p. 219) Article based on AIAA Paper 87-0949 cp873
- J89-033 Strong Mode Localization in Nearly Periodic Disordered Structures. Christophe Pierre and Philip D. Cha, University of Michigan (27, 2, p. 227) Article
- J89-034 Bifurcation Buckling of Circular Cylindrical Shells Under Uniform External Pressure. Tatsuzo Koga, University of Tsukuba, Japan; and Shigeyuki Morimatsu, Toyota Motor Company, Japan (27, 2, p. 242) Article
- J89-035 Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors in Hover. M. A. H. Dinyavari and P. P. Friedmann, *University of California, Los Angeles* (27, 3, p. 257) Article
- J89-036 Scattering of Acoustic and Electromagnetic Waves by an Airfoil. R. T. Ling and T. D. Smith, Northrop Aircraft Division (27, 3, p. 268) Article based on AIAA Paper 88-0180
- J89-037 Viscous Drag Reduction of a Nose Body. Promode R. Bandyopadhyay, NASA Langley Research Center (27, 3, p. 274) Article based on AIAA Paper 88-0135
- J89-038 Structural Similarity of Turbulence in Fully Developed Smooth Pipe Flow. J. C. S. Lai, University of New South Wales, Australia; K. J. Bullock, University of Queensland, Australia; and R. E. Kronauer, Harvard University (27, 3, p. 283) Article
- J89-039 Upwind Formulations for the Euler Equations in Steady Supersonic Flows. Nicola Botta and Maurizio Pandolfi, Politecnico di Torino, Italy (27, 3, p. 293) Article
- J89-040 Semi-Implicit and Fully Implicit Shock-Capturing Methods for Nonequilibrium Flows. H. C. Yee, NASA Ames Research Center; and Judy L. Shinn, NASA Langley Research Center (27, 3, p. 299) Article based on AIAA Paper 87-1116
- J89-041 Selective Suction for Controlling Bursting Events in a Boundary Layer. Mohamed Gad-el-Hak, University of Notre Dame; and Ron F. Blackwelder, University of Southern California (27, 3, p. 308) Article based on AIAA Paper 87-0358

- J89-042 Multiscale Turbulence Effects in Underexpanded Supersonic Jets. Khaled S. Abdol-Hamid, Analytical Services and Materials, Inc.; and Richard G. Wilmoth, NASA Langley Research Center (27, 3, p. 315) Article
- J89-043 Interaction of Jet in Hypersonic Cross Stream. J. S. Shang, D. L. McMaster, N. Scaggs and M. Buck, Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB (27, 3, p. 323) Article
- J89-044 Finite-Element Analysis of Turbulent Diffusion Flames, Y. M. Kim and T. J. Chung, University of Alabama in Huntsville (27, 3, p. 330) Article
- J89-045 Curvature-Dependent Two-Equation Model for Prediction of Turbulent Recirculating Flows, S. W. Park and M. K. Chung, Korea Advanced Institute of Science and Technology (27, 3, p. 340) Article
- J89-046 Flow Around Simply and Multiply Connected Bodies: A New Iterative Scheme for Conformal Mapping. Paolo Luchini and Fernando Manzo, *University of Naples, Italy* (27, 3, p. 345) Article
- J89-047 New Approximation Method for Stress Constraints in Structural Synthesis. Garret N. Vanderplaats, University of California, Santa Barbara; and Eysa Salajegheh, Kerman University, Islamic Republic of Iran (21, 3, p. 352) Article based on AIAA Paper 87-0786 cp872
- J89-048 Flexural Behavior of a Rotating Sandwich Tapered Beam. C. L. Ko, Oakland University (27, 3, p. 359) Article
- J89-049 Investigation of the Influence of Blowing and Combustion on Turbulent Wall Boundary Layers. Clemet Yam and Harry Dwyer, *University of California, Davis* (27, 3, p. 370) Technical Note based on AIAA Paper 87-0226
- J89-050 Boundary-Layer Predictions for Small Low-Speed Contractions. James H. Bell and Rabindra D. Mehta, Stanford University (27, 3, p. 372) Technical Note
- J89-051 Motion and Deformation of Very Large Space Structures. Ramesh B. Malla, University of Connecticut; William A. Nash and Thomas J. Lardner, University of Massachusetts (27, 3, p. 374) Technical Note Errata (27, 6, p. 827)
- J89-053 Supersonic Propeller Noise in a Uniform Flow. Wen-Huei Jou, Flow Research Company (27, 4, p. 385) Article
- J89-054 Resonance Prediction for Closed and Open Wind Tunnel by the Finite-Element Method. In Lee, Stanford University (27, 4, p. 391) Article based on AIAA Paper 86-0898 CP3
- J89-055 Fluctuation of Heat Transfer in Shock Wave/Turbulent Boundary-Layer Interaction. Masanori Hayashi, Shigeru Aso and Tan Anzhong, Kyushu University, Japan (27, 4, p. 399) Article based on AIAA Paper 80-0426 CP801
- J89-056 Optical Boundary-Layer Transition Detection in a Transonic Wind Tunnel. M. Azzazy and D. Modarress, Spectron Development Laboratories, Inc.; and R. M. Hall, NASA Langley Research Center (27, 4, p. 405) Article based on AIAA Paper 87-1430
- J89-057 Initial Development of Noncircular Jets Leading to Axis Switching. Shozo Koshigoe, Ephraim Gutmark and Klaus C. Schadow, Naval Weapons Center; and Arnold Tubis, Purdue University (27, 4, p. 411) Article based on AIAA Paper 88-0037

- J89-058 Flow Visualization and Measurements in a Two-Dimensional Two-Impinging-Jet Flow. H. Elbanna and J. A. Sabbagh, King Abdulaziz University, Saudi Arabia (27, 4, p. 420) Article
- J89-059 Computations of Supersonic Flows Over a Body at High Angles of Attack. O. Baysal and K. Fouladi, Old Dominion University; and D. S. Miller, NASA Langley Research Center (27, 4, p. 427) Article based on AIAA Paper 88-0485
- J89-060 Induced Emission of Radiation from a Large Space-Station-Like Structure in the Ionosphere, D. E. Hastings and J. Wang, Massachusetts Institute of Technology (27, 4, p. 438) Article
- Technical Comment by C. D. Mikkelsen, *Redstone Arsenal* (27, 11, p. 1656) Reply (27, 11, p. 1656)
- J89-061 Oscillating Incompressible Aerodynamics of a Loaded Airfoil Cascade. Hsiao-Wei D. Chiang and Sanford Fleeter, Purdue University (27, 4, p. 446) Article
- J89-062 Design of Airfoils and Cascades of Airfoils. Theodosios P. Korakianitis, Massachusetts Institute of Technology (27, 4, p. 455) Article based on AIAA Paper 87-2171
- J89-063 Computational Aerodynamics of Oscillating Cascades with the Evolution of Stall. F. Sisto, Wenquan Wu, S. Thangam and S. Jonnavithula, Stevens Institute of Technology (27, 4, p. 462) Article based on AIAA Paper 87-2055
- J89-064 Thermal-Stress-Free Fasteners for Joining Orthotropic Materials. Max L. Blosser, NASA Langley Research Center (27, 4, p. 472) Article based on AIAA Paper 87-1609
- J89-065 Compressive Deformation of Embedded High-Performance Polymeric Fibers. R. L. Keller and A. N. Palazotto, Air Force Institute of Technology, Wright-Patterson AFB; and S. J. Bai, University of Dayton Research Institute (27, 4, p. 479) Article
- J89-066 Eigenvector Derivatives with Repeated Eigenvalues. R. Lane Dailey, TRW, Inc. (27, 4, p. 486) Article
- J89-067 Identification of Dynamic Green's Functions in Structural Networks. Alfred S. Carasso and Emil Simiu, National Bureau of Standards (27, 4, p. 492) Article
- J89-068 Beam-Like Bending of Variable-Thickness Sandwich Plates. Charles Libove and Chu-Ho Lu, Syracuse University (27, 4, p. 500) Article
- J89-069 Flow Structures of Coaxial Jet of Mean Velocity Ratio 0.5. N. W. M. Ko and K. M. Lam, University of Hong Kong (27, 5, p. 513) Synoptic
- J89-070 Downwind Sound Propagation in an Atmospheric Boundary Layer, William E. Zorumski and William L. Willshire Jr., NASA Langley Research Center (27, 5, p. 515) Article based on AIAA Paper 86-1923
- J89-071 Analysis of Flux-Split Algorithms for Euler's Equations with Real Gases. B. Grossman and R. W. Walters, Virginia Polytechnic Institute and State University (27, 5, p. 524) Article
- J89-072 Experimental and Numerical Study of Confined Coaxial Turbulent Jets. J. M. Khodadadi and N. S. Vlachos, University of Illinois at Urbana-Champaign (27, 5, p. 532) Article based on AIAA Paper 87-1380

- J89-073 Calculation of Planar and Conical Diffuser Flows. Y. G. Lai and R. M. C. So, Arizona State University; and B. C. Hwang, Naval Ship Research and Development Center (27, 5, p. 542) Article based on AIAA Paper 88-3583 CP888
- J89-074 Structure of Turbulent Sonic Underexpanded Free Jets. S. G. Chuech and G. M. Faeth, *University of Michigan, Ann Arbor* (27, 5, p. 549) Article
- J89-075 Evaluation of Algebraic Turbulence Models for PNS Predictions of Supersonic Flow Past a Sphere-Cone. Siamack A. Shirazi and C. Randall Truman, University of New Mexico, Albuquerque (27, 5, p. 560) Article based on AIAA Paper 87-0544
- J89-076 Surface Pressure Measurements on a Body Subject to Vortex Wake Interaction. A. G. Brand, H. M. McMahon and N. M. Komerath, Georgia Institute of Technology, Atlanta (27, 5, p. 569) Article
- J89-077 Laser-Induced Iodine Fluorescence Technique for Quantitative Measurement in a Nonreacting Supersonic Combustor. D. G. Fletcher and J. C. McDaniel, University of Virginia, Charlottesville (27, 5, p. 575) Article based on AIAA Paper 87-0087
- J89-078 Development of a Viscous Cascade Code Based on Scalar Implicit Factorization. C. J. Knight and D. Choi, Avco Research Laboratory, Inc. (27, 5, p. 581) Article based on AIAA Paper 87-2150
- J89-079 Transitional Flow on Axial Turbomachine Blading, G. J. Walker, U. S. Naval Postgraduate School (27, 5, p. 595) Article based on AIAA Paper 87-0010
- J89-080 Epicyclic Gear Dynamics. Linda Smith Boyd and James Pike, *United Technologies Corporation* (27, 5, p. 603) Article based on AIAA Paper 87-2042
- J89-081 Composite Laminate Free-Edge Reinforcement with U-Shaped Caps Part I: Stress Analysis. W. E. Howard, Terry Gossard Jr. and Robert M. Jones, Virginia Polytechnic Institute and State University (27, 5, p. 610) Article
- J89-082 Composite Laminate Free-Edge Reinforcement with U-Shaped Caps Part II: Theoretical-Experimental Correlation. W. E. Howard, Terry Gossard Jr. and Robert M. Jones, Virginia Polytechnic Institute and State University (27, 5, p. 617) Article
- J89-083 Large Deformation Effects in the Postbuckling Behavior of Composites with Thin Delaminations. G. A. Kardomateas, General Motors Research Laboratories (27, 5, p. 624) Article
- J89-084 Mixed Finite-Element Method for Composite Cylinder Subjected to Impact. William E. Bachrach, Columbia University; and R. Scott Hansen, Spaulding Fibre (27, 5, p. 632) Article
- J89-085 Penetration and Ricochet Phenomena in Oblique Hypervelocity Impact. William P. Schonberg, University of Alabama, Huntsville; and Roy A. Taylor, NASA Marshall Space Flight Center (27, 5, p. 639) Article
- J89-086 Accurate Analytical Solution for Free Vibration of the Simply Supported Triangular Plate. Daniel J. Gorman, University of Ottawa, Canada (27, 5, p. 647) Article
- J89-087 Effects of Transverse Shearing Flexibility on Postbuckling of Plates in Shear. Manuel Stein, NASA Langley Research Center (27, 5, p. 652) Article based on AIAA Paper 87-0866 CP872

- J89-088 Numerical Instabilities in the Calculation of Laminar Separation Bubbles and Their Implications. Tuncer Cebeci, Douglas Aircraft Company (27, 5, p. 656) Technical Note
- J89-089 Analysis of Multi-Element Airfoils by a Vortex Panel Method. H. N. V. Dutt, National Aeronautical Laboratory, India (27, 5, p. 658) Technical Note
- J89-090 Unsteady Pressure Distribution Over a Pitching Airfoil. Pascal L. Ardonceau, École Nationale Supérieur de Mécanique et d'Aerotechnique, France (27, 5, p. 660) Technical Note
- J89-091 Coupled Thermoelasticity Beam Problems. M. R. Eslami and H. Vahedi, *Tehran Polytechnic, Iran* (27, 5, p. 662) Technical Note
- J89-092 Nonlinear Free Vibration of Elastic Plates. G. Chandrasekharappa and H. R. Srirangarajan, *Indian Institute of Technology* (27, 5, p. 665) Technical Note
- J89-093 Extension and Application of Flux-Vector Splitting to Calculations on Dynamic Meshes. W. Kyle Anderson, James L. Thomas and Christopher L. Rumsey, NASA Langley Research Center (27, 6, p. 673) Synoptic based on AIAA Paper 87-1152 CP874
- J89-094 Numerical and Experimental Evaluations of the Flow Past Nested Chevrons. J. F. Foss, Michigan State University; J. K. Foss, University of Southern California, Los Angeles; and P. R. Spalart, NASA Ames Research Center (27, 6, p. 675) Synoptic
- J89-095 Linear Instability Waves in Supersonic Turbulent Mixing Layers. Saad A. Ragab, Virginia Polytechic Institute and State University; and J. L. Wu, Virginia Polytechnic Institute and State University (27, 6, p. 677) Article based on AIAA Paper 87-1418
- J89-096 Boundary-Layer Transition on a Cone and Flat Plate at Mach 3.5. F. -J. Chen and M. R. Malik, High Technology Corporation; and I. E. Beckwith, NASA Langley Research Center (27, 6, p. 687) Article based on AIAA Paper 88-0411
- J89-097 Blade-Vortex Interaction. David R. Poling and Leo Dadone, Boeing Helicopter Company; and Demetri P. Telionis, Virginia Polytechnic Institute and State University (27, 6, p. 694) Article
- J89-098 Effect of Initial Swirl Distribution on the Evolution of a Turbulent Jet. S. Farokhi and R. Taghavi, *University of Kansas*; and E. J. Rice, *NASA Lewis Research Center* (27, 6, p. 700) Article based on AIAA Paper 88-3592
- J89-099 Wakes of Four Complex Bodies of Revolution at Zero Angle of Attack. Veysel Atli, Istanbul Technical University, Turkey (27, 6, p. 707) Article
- J89-100 Effects of Nozzle Exit Boundary-Layer Conditions on Excitability of Heated Free Jets. J. Lepicovsky and W. H. Brown, Lockheed Aeronautical Systems Company (27, 6, p. 712) Article based on AIAA Paper 87-2723
- J89-101 Measurements in Separating Boundary Layers. M. Dianat and I. P. Castro, *University of Surrey, England, UK* (27, 6, p. 719) Article
- J89-102 Potential Flow Over Bodies of Revolution in Unsteady Motion. Ming-Shin Wu, Pablo Garcia-Fogeda and D. D. Liu, Arizona State University (27, 6, p. 725) Article

- J89-103 Separation Shock Motion in Fin, Cylinder, and Compression Ramp--Induced Turbulent Interactions. D. S. Dolling and L. Brusniak, *University of Texas at Austin* (27, 6, p. 734) Article
- J89-104 Explicit Runge-Kutta Method for Unsteady Rotor/Stator Interaction. Philip C. E. Jorgenson and Rodrick V. Chima, NASA Lewis Research Center (27, 6, p. 743) Article based on AIAA Paper 88-0049
- J89-105 Turbulence Model for Rotating Flows. B. Galperin and L. H. Kantha, *Princeto 'Iniversity* (27, 6, p. 750) Article
- J89-106 Aero-Optical Analysis of Compressible Flow Over an Open Cavity. Philip E. Cassady and P. John Terry, *Boeing Aerospace* (27, 7, p. 758) Article
- J89-107 Turbulence Manipulation to Increase Effective Reynolds Numbers in Vehicle Aerodynamics. J. Wiedemann, AUDI AG, FRG; and B. Ewald, Technical University of Darmstadt, FRG (27, 6, p. 763) Article based on AIAA Paper 88-2028 CP884
- J89-108 Separating Flow Over Repeated Surface-Mounted Ribs in a Square Duct. Shou-Shing Hsieh and Ying-Jong Hong, National Sun Yat-Sen University (27, 6, p. 823) Article
- J89-109 Calculation of Unsteady Flows in Turbomachinery Using the Linearized Euler Equations. Kenneth C. Hall, United Technologies Research Center; and Edward F. Crawley, Massachusetts Institute of Technology (27, 6, p. 777) Article
- J89-110 Integrated Approach for Active Coupling of Structures and Fluids, Guru P. Guruswamy, NASA Ames Research Center (27, 6, p. 788) Article
- J89-111 Comparison of the Notched Fatigue Life of Ti-10V-2Fe-3A1 and Ti-6A1-4V. G. R. Yoder, Office of Naval Research; S. J. Gill, Naval Research Laboratory; and R. R. Boyer, Boeing Commercial Airplane Company (27, 6, p. 794) Article based on AIAA Paper 87-0756
- J89-112 Variations of Undamped Rotor Blade Frequencies Subjected to Transient Heat Flux. Anand M. Sharan and Rajeeve Bahree, Memorial University, Canada (27, 6, p. 802) Article
- J89-113 Probabilistic Structural Analysis to Quantify Uncertainties Associated with Turbopump Blades. V. K. Nagpal and R. Rubinstein, Sverup Technology, Inc.; and C. C. Chamis, NASA Lewis Research Center (27, 6, p. 809) Article
- J89-114 Integrated Structural Electromagnetic Shape Control of Large Space Antenna Reflectors. S. L. Padula, H. M. Adelman and M. C. Bailey, NASA Langley Research Center; and R. T. Haftka, Virginia Polytechnic Institute and State University (27, 6, p. 814) Article based on AIAA Paper 87-0824
- J89-115 Separation Control on an Airfoil by Periodic Forcing. A. Bar-Sever, NASA Langley Research Center (27, 6, p. 820) Technical Note
- J89-116 Modeling of Density Fluctuations in Supersonic Turbulent Boundary Layers. Steven A. Lutz, Johns Hopkins University (27, 6, p. 822) Technical Note
- J89-117 Elimination of Temperature Stratification in a Low-Speed Open-Return Wind Tunnel. J. M. Cimbala and W. J. Park, *Pennsylvania State University* (27, 6, p. 823) Technical Note

- J89-118 Parallelism in the Solution of Large Full Linear Systems Using a Matrix Partition Approach. Robert Morris Hintz, General Microelectronics Corporation (27, 6, p. 825) Technical Note
- J89-121 Large-Scale Viscous Simulation of Laminar Vortex Flow Over a Delta Wing. Arthur Rizzi and Bernhard Müller, Aeronautical Research Institute of Sweden (27, 7, p. 833) Article
- J89-122 Numerical Study of Two-Dimensional Impinging Jet Flowfields. C. J. Hwang and J. L. Liu, National Cheng Kung University (27, 7, p. 841) Synoptic based on AIAA Paper 88-0703
- J89-123 Numerical Solution of Navier-Stokes Equations for Two-Dimensional Viscous Compressible Flows. Sunil Kumar Chakrabartty, National Aeronautical Laboratory, India (27, 7, p. 843) Synoptic
- J89-124 Active Control of Sound Fields in Elastic Cylinders by Multicontrol Forces. J. D. Jones, Purdue University; and C. R. Fuller, Virginia Polytechnic Institute and State University (27, 7, p. 845) Article based on AIAA Paper 87-2707
- J89-125 Calculation of Flow Over Iced Airfoils. Tuncer Cebeci, California State University (27, 7, p. 853) Article based on AIAA Paper 88-0112
- J89-126 Turbulence Structure in a Shock Wave/Turbulent Boundary-Layer Interaction. M. S. Selig, Pennsylvania State University; J. Andreopoulos, City College of the City University of New York; K. C. Muck, National Bureau of Standards; J. P. Dussauge, Institute Mécanique Statistique de la Turbulence, France; and A. J. Smits, Princeton University (27, 7, p. 862) Article based on AIAA Paper 87-0550
- J89-127 Prediction of Transition Due to Isolated Roughness. Tuncer Cebeci and David A. Egan, *California State University* (27, 7, p. 870) Article based on AIAA Paper 88-0139
- J89-128 Three-Dimensional Dual-Potential Procedure for Inlets and Indraft Wind Tunnels. K. V. Rao, *Iowa State University*; Joseph L. Steger, *NASA Ames Research Center*; and R. H. Pletcher, *Iowa State University* (27, 7, p. 876) Article based on AIAA Paper 87-0598
- J89-129 Newton Solution of Inviscid and Viscous Problems. V. Venkatakrishnan, Analytical Services and Materials, Inc. (27, 7, p. 885) Article based on AIAA Paper 88-0413
- J89-130 Three-Dimensional Viscous Flow Solutions with a Vorticity-Stream Function Formulation. R. L. Davis and J. E. Carter, United Technologies Research Center; and M. Hafez, University of California, Davis (27, 7, p. 892) Article based on AIAA Paper 87-0601
- J89-131 Structure and Mixing Properties of Pressure-Atomized Sprays. G. A. Ruff, A. D. Sagar and G. M. Faeth, *University of Michigan* (27, 7, p. 901) Article
- J89-132 Godunov Computational Fluid Dynamics Method for Extreme Flow Velocities and Any Equation of State. D. W. Bogdanoff and D. C. Brackett, *University of Washington* (27, 7, p. 909) Article based on AIAA Paper 87-1978

- J89-133 Shock Standoff from Blunt Cones in High-Enthalpy Nonequilibrium Nitrogen Flow. S. L Gai, University College (U. N. S. W.), Australian Defence Force Academy; and P. R. A. Lyons, Australian National University (27, 7, p. 918) Article
- J89-134 Transverse Vibrations of a Trapezoidal Cantilever Plate of Variable Thickness. P. A. A. Laura and R. H. Gutierrez, Institute of Applied Mechanics, Argentina; and R. B. Bhat, Concordia University (27, 7, p. 921) Article
- J89-135 Recent Advances in Analysis of Laminated Beams and Plates Part I: Shear Effects and Buckling. Rakesh K. Kapania and Stefano Raciti, Virginia Polytechnic Institute and State University (27, 7, p. 923) Article
- J89-136 Recent Advances in Analysis of Laminated Beams and Plates Part II: Vibrations and Wave Propagation. Rakesh K. Kapania and Stefano Raciti, Virginia Polytechnic Institute and State University (27, 7, p. 935) Article
- J89-137 Accurate Calculation of Control-Augmented Structural Eigenvalue Sensitivities Using Reduced-Order Models. Eli Livne, University of California, Los Angeles (27, 7, p. 947) Article
- J89-138 Nonlinear Forced Vibration of Orthotropic Rectangular Plates Using the Method of Multiple Scales. Habib Eslami and Osama A. Kandil, Old Dominion University (27, 7, p. 955) Article based on AIAA Paper 87-0855
- J89-139 Two-Mode Nonlinear Vibration of Orthotropic Plates Using Method of Multiple Scales. Habib Eslami and Osama A. Kandil, Old Dominion University (27, 7, p. 961) Article based on AIAA Paper 88-2355
- J89-140 Estimation and Identification of Nonlinear Dynamic Systems. D. Joseph Mook, State University of New York at Buffalo (27, 7, p. 968) Article
- J89-141 Response of Moderately Thick Laminated Cross-Ply Composite Shells Subjected to Random Excitation. Isaac Elishakoff, Technion-Israel Institute of Technology; Gabriel Cederbaum, Tel-Aviv University, Israel; and Liviu Librescu, Virginia Polytechnic Institute and State University (27, 7, p. 975) Article
- J89-142 Trajectory Integration in Vortical Flows. Earll M. Murman and Kenneth G. Powell, Massachusetts Institute of Technology (27, 7, p. 982) Technical Note
- J89-143 Skin-Friction Measurements by Laser-Beam Interferometry. U. R. Müller, Aerodynamics Institut Rheinisch-Westfälische Technische Hochschule, FRG; and F. Feyzi, Aerodynamics Institut, Rheinisch-Westfälische Technische Hochschule, FRG (27, 7, p. 984) Technical Note
- J89-145 Analysis of Low Reynolds Number Separation Bubbles Using Semiempirical Methods. Gordon S. Schmidt, Loral Systems Group; and Thomas J. Mueller, University of Notre Dame (27, 8, p. 993) Article
- J89-146 Flow Structure and Scaling Laws in Lateral Wing-Tip Blowing. C. S. Lee, D. Tavell, N. J. Wood and L. Roberts, Stanford University (27, 8, p. 1002) Article based on AIAA Paper 86-1810 CP865

- J89-147 Computational/Experimental Study of the Flowfield on a Body of Revolution at Incidence. G. G. Zilliac, NASA Ames Research Center (27, 8, p. 1008) Article based on AIAA Paper 87-2277 CP875
- J89-148 Pressure-Based Navier-Stokes Solver Using the Multigrid Method. Chae M. Rhie, Pratt and Whitney Aircraft, United Technologies Corporation (27, 8, p. 1017) Article based on AIAA Paper 86-0207
- J89-149 Convergence of Lift and Drag Predictions by a Morino Panel Method (VSAERO). J. S. Letcher Jr., AeroHydro, Inc. (27, 8, p. 1019) Synoptic based on AIAA Paper 88-0130
- J89-150 Viscous Aerodynamic Analysis of an Oscillating Flat-Plate Airfoil, Linda M. Schroeder and Sanford Fleeter, Purdue University (27, 8, p. 1021) Article based on AIAA Paper 88-0130
- J89-151 Further Experiments on Supersonic Turbulent Flow Development in a Square Duct. D. O. Davis and F. B. Gessner, University of Washington (27, 8, p. 1023) Article based on AIAA Paper 87-1287
- J89-152 Unsteady Transonic Airfoil Computation Using Implicit Euler Scheme on Body-Fixed Grid. Osama A. Kandil and H. Andrew Chuang, Old Dominion University (27, 8, p. 1031) Article
- J89-153 Turbulence Structure in an Initial Mixing Region of a Two-Dimensional Curved Jet. Wataru Masuda and Shigeo Andoh, *Technological University of Nagaoka, Japan* (27, 8, p. 1038) Article
- J89-154 Investigation of the Flow Structure Around a Rapidly Pitching Airfoil. Miguel R. Visbal and J. S. Shang, Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB (27, 8, p. 1044) Article
- J89-155 Equation for the Probability Density Function of Velocity and Scalar for Turbulent Shear Flows. W. Kollmann and A. Wu, *University of California at Davis* (27, 8, p. 1052) Article based on AIAA Paper 87-1348
- J89-156 Experimental Investigation of Straight and Curved Annular Wall Jets. L. C. Rodman, N. J. Wood and L. Roberts, Stanford University (27, 8, p. 1059) Article
- J89-157 Near-Wall k-c Turbulence Modeling. N. N. Mansour, J. Kim and P. Moin, NASA Ames Research Center (27, 8, p. 1068) Article
- J89-158 Experimental Comparison of Two Hot-Wire Techniques in Supersonic Flow. D. A. Walker and W. F. Ng, Virginia Polytechnic Institute and State University; and M. D. Walker, State University of New York (27, 8, p. 1074) Article based on AIAA Paper 88-0422
- J89-159 Drag Measurements on a Laminar Flow Body of Revolution. David A. Dress, NASA Langley Research Center (27, 8, p. 1081) Article based on AIAA Paper 88-2010
- J89-160 Finite-Element Navier-Stokes Analysis of the Flow About a Finite Plate. Jean Caille and Joseph A. Schetz, Virginia Polytechnic Institute and State University (27, 8, p. 1089) Article based on AIAA Paper 87-1442

- J89-161 Experimental Identification of Modal Momentum Coefficients and Modal Identity Parameters. Y. Soucy, F. R. Vigneron and T. Steele, Canadian Space Agency, Canada (27, 8, p. 1097) Article
- J89-162 Flutter Analysis of Cantilever Composite Plates in Subsonic Flow. Kuo-Juin Lin, Pong-Jeu Lu and Jiann-Quo Tarn, National Cheng Kung University, Taiwan, ROC (27, 8, p. 1102) Article
- J89-163 Nonisothermal Elastoviscoplastic Snap-Through and Creep Buckling of Shallow Arches. R. Riff, Georgia Institute of Technology (27, 8, p. 1110) Article based on AIAA Paper 87-0806 CP872
- J89-164 Vibrational Characteristics of Composites Panels with Cutouts. Andrew S. Bicos and George S. Springer, Stanford University (27, 8, p. 1116) Article
- J89-165 Aerodynamics of High-Lift, Low-Aspect-Ratio Unswept Wings. Joseph Katz, San Diego State University (27, 8, p. 1123) Technical Note
- J89-166 Diffuser Performance of Two-Stream Supersonic Wind Tunnels. Dimitri Papamoschou, California Institute of Technology (27, 8, p. 1124) Technical Note
- J89-167 Velocity Profile Model for Two-Dimensional Zero-Pressure Gradient Transitional Boundary Layers. H. Pfeil and T. Müller, Technische Hochschule Darmstadt, FRG (27, 8, p. 1127) Technical Note
- J89-168 Mass Transfer in a Binary Gas Jet. J. Y. Zhu, R. M. C. So and M. V. Ötügen, Arizona State University (27, 8, p. 1132) Technical Note
- J89-169 Unsteady Transition Location. Kenneth F. Stetson, Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB (27, 8, p. 1135) Technical Note
- J89-170 Effects of Transverse Curvature on Oscillatory Flow Along a Circular Cylinder. Y. T. Chew, National University of Singapore; and C. Y. Liu, Nanyang Technological Institute, Singapore (27, 8, p. 1137) Technical Note
- J89-171 Parametric Study of Statistical Bias in Laser Doppler Velocimetry. Richard D. Gould, North Carolina State University; Warren H. Stevenson and H. Doyle Thompson, Purdue University (27, 8, p. 1140) Technical Note
- J89-172 Noise Bias in Various Formulations of Ibrahim's Time Domain Technique. Joseph J. Hollkamp and Stephen M. Batill, *University of Notre Dame* (27, 8, p. 1142) Technical Note
- J89-176 Numerical Simulation of Vortical Flows Over a Strake-Delta Wing. Kozo Fujii and Lewis B. Schiff, NASA Ames Research Center (27, 9, p. 1153) Article based on AIAA Paper 87-1229
- J89-177 Boundary-Layer Tables for Similar Compressible Flow. Yoon-Yeong Bae and George Emanuel, *University of Oklahoma* (27, 9, p. 1163) Synoptic
- J89-178 Upwind Algorithm for the Parabolized Navier-Stokes Equations. Scott L. Lawerence, John C. Tannehill and Denny S. Chausee, *Iowa State University* (27, 9, p. 1175) Article

- J89-179 Asymptotic Theory of Propeller Noise Part I: Subsonic Single-Rotation Propeller. A. B. Parry, Strathclyde University, Scotland, UK; and D. G Crighton, Cambridge University, England, UK (27, 9, p. 1184) Article based on AIAA Paper 86-1891
- J89-180 Calculation of Laminar Separation Bubbles in the Wake Inflation/Deflation Regime. A. P. Rothmayer, *Iowa State University* (27, 9, p. 1191) Article based on AIAA Paper 88-0605
- J89-181 Vortical Patterns in the Wake of an Oscillating Airfoil. Manoochehr M. Koochesfahani, California Institute of Technology (27, 9, p. 1200) Article based on AIAA Paper 87-0111
- J89-182 Reynolds Number Effect on Separation Structures at Normal Shock Wave/Turbulent Boundary-Layer Interaction. P. Doerffer, Polish Academy of Sciences; and U. Dallmann, German Aerospace Research Establishment, FRG (27, 9, p. 1206) Article based on AIAA Paper 87-1370
- J89-183 Computational Analysis of Three-Dimensional Turbulent Flow Around a Bluff Body in Ground Proximity. Taeyoung Han, General Motors Research Laboratories (27, 9, p. 1213) Article based on AIAA Paper 88-3766 CP888
- J89-184 Calculation of Transonic Flows Over Bodies of Varying Complexity Using Slender Body Theory. Karunamurthy Rajagopal, University of California, Santa Barbara; Norman D. Malmuth, Rockwell International Science Center; and Wilbert J. Lick, University of California, Santa Barabara (27, 9, p. 1220) Article based on AIAA Paper 88-0005
- J89-185 Nonlinear Fluid Slosh Coupled to the Dynamics of a Spacecraft. Lee D. Peterson, Sandia National Laboratories; Edward F. Crawley and R. John Hansman, Massachusetts Institute of Technology (27, 9, p. 1230) Article based on AIAA Paper 88-2470
- J89-186 Analysis of the Expansion-Fan Flowfield for Holes in a Hypersonic Configuration. John J. Bertin, University of Texas at Austin; William J. Tedeschi, Daniel P. Kelly, Albino C. Bustamante and Eric W. Reece, Sandia National Laboratories (27, 9, p. 1241) Article based on AIAA Paper 88-0373
- J89-187 New Concepts for Finite-Element Mass Matrix Formulations. C. Stavrinidis, European Space Agency, the Netherlands; J. Clinkemaillie and J. Dubois, Engineering System International, France (27, 9, p. 1249) Article
- J89-188 Shape Optimization of Three-Dimensional Continuum Structures via Force Approximation Techniques. Srinivas Kodiyalam, Engineering Design Optimization, Inc.; and Garret N. Vanderplaats, University of California, Santa Barbara (27, 9, p. 1256) Article based on AIAA Paper 88-2437 CP882
- J89-189 Continuum Modeling of Flexible Structures with Application to Vibration Control. W. H. Bennett and H. G. Kwatny, *Techno-Sciences, Inc.* (27, 9, p. 1264) Article based on AIAA Paper 86-0173
- J89-190 Failure of Compression-Loaded Multidirectional Composite Laminates. Mark J. Shuart, NASA Langley Research Center (27, 9, p. 1274) Article
- J89-191 How Gravity and Joint Scaling Affect Dynamic Response. S. T. Hsu, J. H. Griffin and J. Bielak, Carnegie Mellon University (27, 9, p. 1280) Article

- J89-192 Surface Curvature Effect on the Calculation of Separation Bubble. D. H. Choi and D. J. Kang, Korea Advanced Institute of Science and Technology, South Korea (27, 9, p. 1288) Technical Note
- J89-193 Evaluation of the Gradient Model of Turbulent Transport Through Direct Lagrangian Simulation. Peter S. Bernard and Mohamed F. Ashmawey, *University of Maryland*; and Robert A. Handler, *Naval Research Laboratory* (27, 9, p. 1290) Technical Note
- J89-194 Steady, Shock-Capturing Method Applied to One-Dimensional Nozzle Flow. S. Parameswaran, Texas Tech University (27, 9, p. 1292) Technical Note
- J89-195 Inviscid, Unsteady, Transonic Axisymmetric Flow in Nozzles with Shock Waves. Brazil Alves, Carlos Frederico Estrada, Instituto de Atividades Espaciais; and Demétrio Bastos-Netto, INPE, Instituto de Pesquisas Espaciais, Brazil (27, 9, p. 1295) Technical Note
- J89-196 Finite-Element Method Applied to Transonic Flow Over a Bulbous Payload Shroud. R. C. Mehta and T. Jayachandran, Vikram Sarabhai Space Centre (27, 9, p. 1298) Technical Note
- J89-197 Transonic Flow Modes of an Axisymmetric Blunt Body. Keith Koenig, Mississippi State University; David H. Bridges, California Institute of Technology; and Gary T. Chapman, NASA Ames Research Center (27, 9, p. 1301) Technical Note based on AIAA Paper 88-3536 CP888
- J89-198 Nonlinear Free Flexural Vibration of Thin Circular Cylindrical Shells. T. K. Varadan, Indian Institute of Technology; G. Prathap, National Aeronautical Laboratory, India; and H. V. Ramani, Defence Research and Development Laboratory, India (27, 9, p. 1303) Technical Note
- J89-204 Numerical Simulation of Rolling Up of Leading/Trailing-Edge Vortex Sheets for Slender Wings. Yin Xie-yuan, Xia Nan and Deng Guo-hua, University of Science and Technology of China (27, 10, p. 1313) Article
- J89-205 Second-Moment Closure for the Near-Wall Sublayer: Development and Application. B. E. Launder and N. Shima, University of Manchester Institute of Science and Technology, England, UK (27, 10, p. 1319) Article
- J89-206 Constructing a Continuous Parameter Range of Computational Flows. H. Thomas Sharp and L. Sirovich, *Brown University* (27, 10, p. 1326) Article
- J89-207 Comparative Study of High-Resolution Shock-Capturing Schemes for a Real Gas. J.-L. Montagné and H. C. Yee, NASA Ames Research Center; and M. Vinokur, Sterling Software (27, 10, p. 1332) Article
- J89-208 Combustion-Related Shear-Flow Dynamics in Elliptic Supersonic Jets. K. C. Schadow, E. Gutmark, S. Koshigoe and K. J. Wilson, Naval Weapons Center (27, 10, p. 1347) Article
- J89-209 Turbulence Modeling in a Hypersonic Inlet. W. F. Ng, K. Ajmani and A. C. Taylor III, Virginia Polytechnic Institute and State University (27, 10, p. 1354) Article based on AIAA Paper 88-2957
- J89-210 Nozzle Geometry Effects on Supersonic Jet Interaction. R. W. Wlezien, *McDonnell Douglas Research Laboratories* (27, 10, p. 1361) Article based on AIAA Paper 87-2694

- J89-211 Spatiotemporal Adaptation Algorithm for Two-Dimensional Reacting Flows. Mehtab M. Pervaiz and Judson R. Baron, Massachusetts Institute of Technology (27, 10, p. 1368) Article based on AIAA Paper 88-0510
- J89-212 Euler Correction Method for Two- and Three-Dimensional Transonic Flows. Thong Q. Dang and Lee-Tzong Chen, Douglas Aircraft Company (27, 10, p. 1377) Article based on AIAA Paper 87-0522
- J89-213 Time-Dependent Analysis of an N<sub>2</sub>O Gasdynamic Laser, K. P. J. Reddy, *Indian Institute of Science, India* (27, 10, p. 1387) Article
- J89-214 Buckling and Postbuckling of Laminated Composite Plates with Ply Dropoffs. Marc T. DiNardo and Paul A. Lagace, Massachusetts Institute of Technology (27, 10, p. 1392) Article based on AIAA Paper 87-0730 CP872
- J89-215 Degradation of Mechanical Properties of Advanced Composites Exposed to Aircraft Environment. W. J. Horn, F. M. Shaikh and A. Soeganto, Wichita State University (27, 10, p. 1399) Article based on AIAA Paper 86-0945 CP863
- J89-216 Optimal Location of Actuators for Correcting Distortions in Large Truss Structures. Ricardo A. Burdisso and Raphael T. Haftka, Virginia Polytechnic Institute and State University (27, 10, p. 1406) Article
- J89-217 Power Law and Fractional Calculus Model of Viscoelasticity. Ronald L. Bagley, Air Force Institute of Technology, Wright-Patterson AFB (27, 10, p. 1412) Article
- J89-218 Equivalence of Continuum and Discrete Methods of Shape Design Sensitivity Analysis. Kyung K. Choi and Sung-Ling Twu, University of Iowa (27, 10, p. 1418) Article
- J89-219 Dynamic Analysis for Free Vibrations of Rotating Sandwich Tapered Beams. C. L. Ko, Oakland University (27, 10, p. 1425) Article
- J89-220 Sensitivity of Actively Damped Structures to Imperfections and Modeling Errors. Raphael T. Haftka and Rakesh K. Kapania, Virginia Polytechnic Institute and State University (27, 10, p. 1434) Article
- J89-221 Transverse Shear Deformation in Orthotropic Cylindrical Pressure Vessels Using a Higher-Order Shear Theory. S. T. Dennis and A. N. Palazotto, Air Force Institute of Technology, Wright-Patterson AFB (27, 10, p. 1441) Article based on AIAA Paper 88-291 CP882
- J89-222 Unsteady Vortical Distrubances Around a Thin Airfoil in the Presence of a Wall. G. A. Gebert and H. M. Atassi, University of Notre Dame (27, 10, p. 1448) Technical Note
- J89-223 Use of the Kirchhoff Method in Acoustics. A. S. Lyrintzis and A. R. George, Cornell University (27, 10, p. 1451) Technical Note based on AIAA Paper 87-2673
- J89-224 New Series Expansion Method for the Solution of the Falkner-Skan Equation. Liu Yu and Lyu Yili, Northwestern Polytechnical University, China (27, 10, p. 1453) Technical Note

- J89-225 Differing Development of the Velocity Profiles of Three-Dimensional Turbulent Boundary Layers. H. Pfeil and T. Amberg, Institute for Thermal Turbomachines, Technische Hochschule Darmstadt, FRG (27, 10, p. 1456) Technical Note
- J89-226 Comparison of Iterative and Direct Solution Methods for Viscous Flow Problems. C. P. van Dam, University of California, Davis; and M. Hafez, University of California, Davis (27, 10, p. 1459) Technical Note
- J89-227 Transonic Flows with Vorticity Transport Around Slender Bodies. Goetz H. Klopfer and David Nixon, Nielsen Engineering & Research, Inc. (27, 10, p. 1461) Technical Note
- J89-228 Generalized Method of Predicting Optimal Performance of Active Noise Controllers. C. G. Molo and R. J. Bernhard, *Purdue University* (27, 11, p. 1473) Article based on AIAA Paper 87-2705
- J89-229 Propagation of Quasiplane Acoustic Waves along an Impedance Boundary. G. L. McAninch, NASA Langley Research Center; and M. K. Myers, George Washington University (27, 11, p. 1479) Article based on AIAA Paper 88-0179
- J89-230 Prediction and Control of Transition in Supersonic and Hypersonic Boundary Layers. Mujeeb R. Malik, *High Technology Corporation* (27, 11, p. 1487) Article
- J89-231 Flow Reversal and Intermittency of a Turbulent Jet. L. P. Chua and R. A. Antonia, *University of Newcastle, Australia* (27, 11, p. 1494) Article
- J89-232 Theory for Radial Jet Reattachment Flow. R. H. Page, L. L. Hadden and C. Ostowari, *Texas A&M University* (27, 11, p. 1500) Article based on AIAA Paper 88-3589 CP888
- J89-233 Experimental Investigation of Confined Turbulent Jets Part I: Single-Phase Data. C. J. Park and L. -D. Chen, University of Iowa (27, 11, p. 1506) Article
- J89-234 Experimental Investigation of Confined Turbulent jets--Part II: Particle-Laden Flow Data. C. J. Park and L. -D. Chen, *University of Iowa* (27, 11, p. 1511) Article
- J89-235 Vortex Simulation of Spatially Growing Three-Dimensional Mixing Layers. Osamu Inoue, *Tohoku University, Japan* (27, 11, p. 1517) Article based on AIAA Paper 87-1311
- J89-236 Measurement of Residence Time, Air Entrainment Rate, and Base Pressure in the Near Wake of a Cylindrical Body in Subsonic Flow. D. W. Roberds, W. K. McGregor and B. W. Hartsfield, Sverdrup Technology, Inc., Arnold Air Force Station; R. J. Schulz, University of Tennessee Space Institute; and R. P. Rhodes, University of Tennessee Space Institute (27, 11, p. 1524) Article based on AIAA Paper 87-1607
- J89-237 Investigation of Turbulent Jet Impingement in a Confined Crossflow. G. D. Catalano, K. S. Chang and J. A. Mathis, Louisiana State University (27, 11, p. 1530) Article
- J89-238 Direct Simulation of Three-Dimensional Hypersonic Flow About Intersecting Blunt Wedges. M. Cevdet Celenligil, Vigyan Research Associates, Inc.; Graeme A. Bird, University of Sydney, Australia; and James N. Moss, NASA Langley Research Center (27, 11, p. 1536) Article based on AIAA Paper 88-0463

- J89-239 Progress in Direct Numerical Simulations of Turbulent Reacting Flows. W. -H. Jou, Flow Research Company; and James J. Riley, University of Washington (27, 11, p. 1543) Article
- J89-240 Experimental Shock-Wave Interference Heating on a Cylinder at Mach 6 and 8. Allan R. Wieting, NASA Langley Research Center; and Michael S. Holden, Calspan-University of Buffalo Research Center (27, 11, p. 1557) Article based on AIAA Paper 87-1511
- J89-241 Application of the Hypersonic Analogy for Validation of Numerical Simulations. Shmuel Eidelman, Science Applications International Corp. (27, 11, p. 1566) Article
- J89-242 Closed-Form Solutions for Nonlinear Quasi-Unsteady Transonic Aerodynamics. Gabriel A. Oyibo, *Polytechnic University* (27, 11, p. 1572) Article
- J89-243 New Method for Measurement of Surface Pressure Using Magnetic Tape. Takeyoshi Kimura and Masatomi Nishio, Kobe University, Japan (27, 11, p. 1579) Article
- J89-244 Method for Nonlinear Optimization with Discrete Design Variables. Gregory R. Olsen, Failure Analysis Associates; and Garret N. Vanderplaats, VMA Engineering (27, 11, p. 1584) Article based on AIAA Paper 87-9789 CP872
- J89-245 Transient Response of Graphite/Epoxy and Kevlar/Epoxy Laminates Subjected to Impact. Douglas S. Cairns and Paul A. Lagace, Massachusetts Institute of Technology (27, 11, p. 1590) Article based on AIAA Paper 88-2328 CP882
- J89-246 Closed-Form Solutions for Arbitrary Laminated Anisotropic Cylindrical Shells (Tubes) Including Shear Deformation. Reaz A. Chaudhuri and Kamal R. Abu-Arja, University of Utah (27, 11, p. 1597) Article
- J89-247 Vibration Analysis of Composite Turbopropellers Using a Nonlinear Beam-Type Finite-Element Approach. J. B. Kosmatka and P. P. Friedmann, *University of California, Los Angeles* (27, 11, p. 1606) Article
- J89-248 Semianalytical Structure Sensitivity Formulation in Boundary Elements. Sunil Saigal, Carnegie Mellon University; R. Aithal and J. H. Kane, Worcester Polytechnic Institute (27, 11, p. 1615) Article
- J89-249 Integrated Nonlinear Structural Analysis and Design. Raphael T. Haftka, Virginia Polytechnic Institute and State University (27, 11, p. 1622) Article based on AIAA Paper 88-2380 CP882
- J89-250 Stochastic Approach to Modeling Fatigue Crack Growth. B. F. Spencer Jr. and J. Tang, University of Notre Dame; and M. E. Artley, U. S. Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB (27, 11, p. 1628) Article based on AIAA Paper 88-2419 CP882
- J89-251 Parameter Identification of Discrete-Time Series Models for Structural Response Prediction, S. M. Batill and J. J. Hollkamp, *University of Notre Dame* (27, 11, p. 1636) Article based on AIAA Paper 88-2231 CP882
- J89-252 Computation of Unsteady Laminar Boundary Layers Subject to Traveling-Wave Freestream Fluctuations. R. L. Evans, University of British Columbia, Canada (27, 11, p. 1644) Technical Note

- J89-253 Shock-Wave/Boundary-Layer Interaction at a Swept Compression Corner. Oktay Özcan and M. Orhan Kaya, Istanbul Technical University, Turkey (27, 11, p. 1646) Technical Note
- J89-254 Critique of Turbulence Models for Shock-Induced Flow Separation. L. E. Ericsson, Lockheed Missiles & Space Company, Inc. (27, 11, p. 1648) Technical Note based on AIAA Paper 88-3525 CP888
- J89-255 Free Rotation of a Circular Ring with an Unbalanced Mass. L. T. Watson, Virginia Polytechnic Institute and State University; and C. Y. Wang, Michigan State University (27, 11, p. 1650) Technical Note
- J89-256 Stability of a Viscoelastic Rotor-Disk System under Dynamic Axial Loads. Sunil K. Sinha, General Electric Company (27, 11, p. 1653) Technical Note
- J89-262 Potential Flow Calculation for Three-Dimensional Wings and Wing-Body Combination in Oscillatory Motion. N. Singh, S. Aika and B. C. Basu, *Indian Institute of Technology, India* (27, 12, p. 1664) Synoptic
- J89-263 Unstable Vortices in the Near Region of a Internal Flow Cavity. L. K. Isaacson, M. K. Denison and J. C. Crepeau, University of Utah (27, 12, p. 1666) Article
- J89-264 Navier-Stokes Computations of Lee-Side Flows over Delta Wings. James L. Thomas, NASA Langley Research Center; and Richard W. Newsome, Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB (27, 12, p. 1672) Article
- J89-265 Essential Ingredients of a Method for Low Reynolds Number Airfoils. Tuncer Cebeci, California State University (27, 12, p. 1679) Article
- J89-266 Three-Dimensional Shear-Driven Boundary-Layer Flow with Streamwise Adverse Pressure Gradient. David M. Driver, NASA Ames Research Center; and Sheshagiri K. Hebbar, Naval Postgraduate School (27, 12, p. 1688) Article based on AIAA Paper 88-3661 CP888
- J89-267 Separation Shock Dynamics in Mach 5 Turbulent Interactions Induced by Cylinders. D. S. Dolling and D. R. Smith, University of Texas at Austin (27, 12, p. 1697) Article based on AIAA Paper 88-0305
- J89-268 Defect Stream Function, Law-of-the-Wall/Wake Method Turbulent Boundary Layers. Richard W. Barnwell, NASA Langley Research Center; Richard A. Wahls and Fred R. DeJarmette, North Carolina State University (27, 12, p. 1706) Article based on AIAA Paper 88-0137
- J89-269 Comparative Study of Turbulence Models in Predicting Turbulent Pipe Flow. Part II: Reynolds Stress and k-e Models. A. Pollard and R. Martinuzzi, *Queen's University, Canada* (27, 12, p. 1713) Article
- J89-270 Free-Field Correction Factor for Spherical Acoustic Waves Impinging on Cylinders. C. R. Fuller, Virginia Polytechnic Institute and State University (27, 12, p. 1721) Article based on AIAA Paper 87-2735
- J89-270 Modeling of Liquid Jets Injected Transversely into a Supersonic Crossflow. S. D. Heister, T. T. Nguyen and A. R. Karagozian, *University of California, Los Angeles* (27, 12, p. 1721) Article based on AIAA Paper 88-0100

- J89-272 Instability of Nonuniform Density Free Shear Layers with a Wake Profile. M. M. Koochesfahani and C. E. Frieler, California Institute of Technology (27, 12, p. 1734) Article based on AIAA Paper 87-0047
- J89-273 Spectral Observation in a Forced Mixing Layer. Daniela Tordella and Walter H. Christiansen, University of Washington (27, 12, p. 1740) Article
- J89-274 Mixing Control in a Plane Shear Layer. K. Z. Korczak and R. A. Wessel, Case Western Reserve University (27, 12, p. 1743) Article
- J89-275 Numerical Study of Chemically Reacting Flows Using an LU-SSOR Scheme. Jian Shun Shuen, NASA Lewis Research Center; and Seokkwan Yoon, NASA Ames Research Center (27, 12, p. 1751) Article based on AIAA Paper 88-0436
- J89-276 Approximations for Nonequilibrium Hypervelocity Aerodynamics. R. J. Stalker, *University of Brisbane, Australia* (27, 12, p. 1760) Article based on AIAA Paper 88-0459
- J89-277 Study of Inviscid, Supersonic Mixing Layers Using a Second-Order Total Variational Diminishing Scheme. Mieljo Soetrisno, Scott Eberhardt and James R. Riley, University of Washington; and Patrick McMurtry, University of Utah (27, 12, p. 1769) Article
- J89-278 Design of Axisymmetric Bodies with Minimum Transonic Drag. Cuong P. Nghiem and Helge Norstrud, Norwegian Institute of Technology (27, 12, p. 1817) Technical Note
- J89-279 Sound Radiation from an Airfoil Encountering an Oblique Gust in its Plane of Motion. Stewart A. L. Glegg, Florida Atlantic University (27, 12, p. 1819) Technical Note
- J89-280 Spectral Measurement of Pressure Fluctuations on Riblets. W. L. Keith, Naval Underwater Systems Center (27, 12, p. 1821) Technical Note
- J89-281 Calculation of Asymmetric Vortex Separation on Cones and Tangent Ogives Based on Discrete Vortex Model. Suel Chin, University of Kansas; Thomas G. Gainer, NASA Langley Research Center; and C. Edward Lan, University of Kansas (27, 12, p. 1823) Technical Note
- J89-282 High Reynolds Number Wedge-Induced Separation Lengths at Mach 6. Peter J. Disimile, University of Cincinnati; and Norman E. Scaggs, Wright-Patterson AFB (27, 12, p. 1826) Technical Note
- J89-283 Numerical Modeling of a Radio Frequency Plasma in Argon. Robert Rhodes and Dennis Keefer, *University of Tennessee Space Institute* (27, 12, p. 1778) Article based on AIAA Paper 88-0726
- J89-284 Mechanism of Sidewall Effect Studied with Oil Flow Visualization. Yaoxi Su, Northwestern Polytechnical Institute, China (27, 12, p. 1827) Technical Note
- J89-285 Postbuckling Behavior of Laminated Plates Using a Direct Energy-Minimization Technique. Pierre J. Minguet, John Dugundji and Paul Lagace, Massachusetts Institute of Technology (27, 12, p. 1784) Article

J89-286 Optimum Design of Systems for Dynamics and Controls Using Sequential Quadratic Programming. C. H. Tseng and J. S. Arora, *University of Iowa* (27, 12, p. 1792) Article based on AIAA Paper 88-2303 CP882

J89-287 Effects of a Piezo-Actuator on a Finitely Deformed Beam Subjected to General Loading. Seyoung Im, Korea Advanced Institute of Science and Technology; and S. N. Atluri, Center for the Advancement of Computational Mechanics, Georgia Institute of Technology (27, 12, p. 1800) Article J89-288 Buckling and Vibration of Laminated Composite Plates Using Various Plate Theories. J. N. Reddy and A. A. Khdeir, Virginia Polytechnic Institute and State University (27, 12, p. 1807) Article

J89-289 Refinement of Higher-Order Laminated Plate Theories. K. Bhaskar and T. K. Varadan, *Indian Institute of Technology*, *India* (27, 12, p. 1829) Technical Note

## **Books Reviewed During 1989**

Flow Visualization IV, edited by C. Veret, Hemisphere Publishing Corp., (27, 2, p. 249); reviewed by T. J. Mueller.

**Dynamics of Multibody Systems**, edited by R. E. Roberson and R. Schwertassek, *Springer Verlag* (27, 7, p. 992); reviewed by T. R. Kane.